Nokia Customer Care

Service Manual

RM-208 (Nokia E65)

Mobile Terminal

Part No: 9254835 (Issue 1)

COMPANY CONFIDENTIAL

NOKIA

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	01/2007	Tiina Savén	Original issue

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IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Ni-Cd/NiMh batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Nokia E65 Service Manual Structure

1 General Information
2 Parts Lists and Component Layouts
3 Service Software Instructions
4 Service Tools and Service Concepts
5 Disassembly / Reassembly Instructions
6 BB Troubleshooting and Manual Tuning Guide
7 RF Troubleshooting and Manual Tuning Guide
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9 System Module
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1 — General Information

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RM-208 product selection

Nokia RM-208 is a WCDMA/GSM quad band handportable phone, supporting WCDMA 2100 (UMTS) , EGSM 850/900/1800/1900 bands and WLAN 802.11g.

The MMS implementation follows the OMA MMS standard release 1.2.

WAP 2.0 compatible browser supports XHTML Mobile Profile (MP) and uses a TCP/IP stack to communicate with a gateway in network.

RM-208 uses Symbian 9.1a operating system and supports also MIDP Java 2.0 & CLDC1.1, providing a good platform for 3rd party applications.

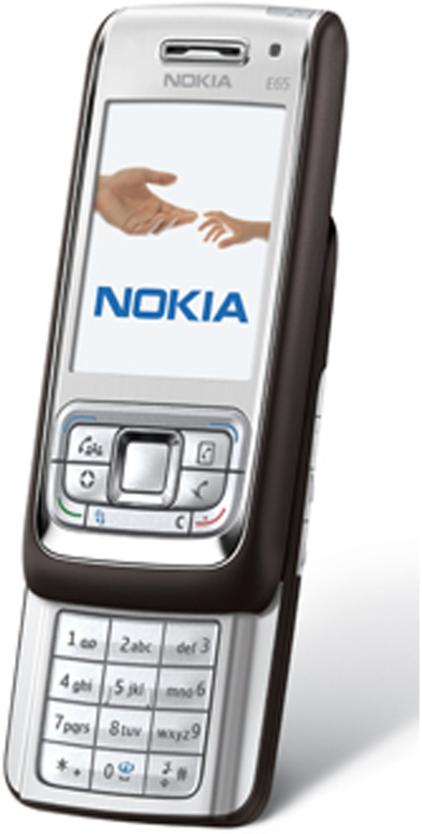

Figure 1 View of RM-208

RM-208 product features and sales package

Bearers & transport

- RM-208 is a 3GPP Release 99 (+ Geran feature pack 1) terminal supporting WCDMA, EGPRS and GPRS data bearers.
- The maximum bit rate for WCDMA is up to 384 kbps for downlink and 384 kbps for uplink with simultaneous CS speech (12.2 (AMR) kbps).
- For GSM networks RM-208 is a class B terminal with EGPRS multislot class 32 (5 Rx, 3 Tx, SUM=6) and GPRS multislot class 32 (5 Rx, 3 Tx, SUM=6).

Software platform

- SW platform: Nokia Series 60 3rd Edition

Connectivity

- Bluetooth 1.2 wireless technology
- IrDA
- Pop-Port™ interface with USB
- 2.0 mm charger connector
- WLAN 802.11g
- Dual transfer mode

Productivity

- SMS, MMS and email
- MS Word, PowerPoint , Excel and Adobe PDF viewers
- PIM (Calendar & Contacts)
- HTML Nokia and XHTML browser
- Video streaming (3GPP)
- Logs (last calls , timers and history list)
- Instant messaging
- Java™ MIDP 2.0, CLDC 1.13D API, PIM API, File access API
- MP3
- OMA DRM 1.0 with forward lock
- Data Transfer

Sales package

- Transceiver RM-208
- BL-5F Li-ion Battery Cell
- AC-4 Travel Charger
- All-in-one User Guide (warranty card + accessory info + getting started sheet + invitational module for Club Nokia)
- Headset HS-5
- Connectivity Cable CA-53
- Quickstart guide

Product and module list

Module name	Type code	Notes
System/RF Module	1YB	Main PWB with components
UI flex	1yc	
T9 flex	1yd	
Camera flex	1ye	
SIM card module	1yf	

Mobile enhancements

Table 1 Audio

Enhancement	Type
Headset	HS-5
Bluetooth headset BH 600	HS-59W
Bluetooth headset BH 800	HS-24W
Bluetooth headset BH 900	HS-25W

Table 2 Car

Enhancement	Type
Advanced car kit	CK-20W
Car kit phone	N616
Wireless plug-in car handsfree	HF-6W
Mobile charger	DC-4
Mobile holder	CR-39
Headrest handsfree	BHF-3
Plug-in car handsfree	HF-3

Table 3 Data

Enhancement	Type
Connectivity cable	CA-53
Universal passive desk stand	DT-13
1GB memorycard	MU-22

Table 4 Imaging

Enhancement	Type
Nokia image album	PD-1
Nokia remote camera	PT-6

Table 5 Messaging

Enhancement	Type
Wireless keyboard	SU-8W
Digital pen II	SU-27W

Table 6 Power

Enhancement	Type
Battery	BP-5F
Travel charger	AC-5
Compact charger	AC-3

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T)	Weight (g)	Volume (cm^3)
Transceiver with BP-5F 1000mAh li-ion battery back	105 x 49 x 15.5 mm	115 (including BP-5L battery)	74

Main RF characteristics for GSM850/900/1800/1900 and WCDMA1900/2100 phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA1900 or WCDMA2100
Rx frequency band	GSM850: 869 - 894MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA1900: 1930-1990MHz
	WCDMA2100: 2110 - 2170 MHz
Tx frequency band	GSM850: 824 - 849MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA1900: 1850-1910MHz
	WCDMA2100: 1920 - 1980 MHz
Output power	GSM850: +5 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA -50 ... 24 dBm

Parameter	Unit
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
Channel spacing	200 kHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BL-5F	1000	up to 7 hrs	up to 8 days

Charging times

AC-4
1.5 hrs

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15ºC...+55ºC	Specifications fulfilled
Reduced performance	-25ºC...-15ºC +55ºC...+70ºC	Operational for shorts periods only
Intermittent operation	-40ºC...-15ºC +70ºC...+85 ºC	Operation not guaranteed but an attempt to operate does not damage the phone.
No operation or storage	<-40ºC...>+85ºC	No storage or operation: an attempt may damage the phone.
Charging allowed	-25ºC...+50ºC	
Long term storage conditions	0ºC...+85ºC	

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2 — Parts Lists and Component Layouts

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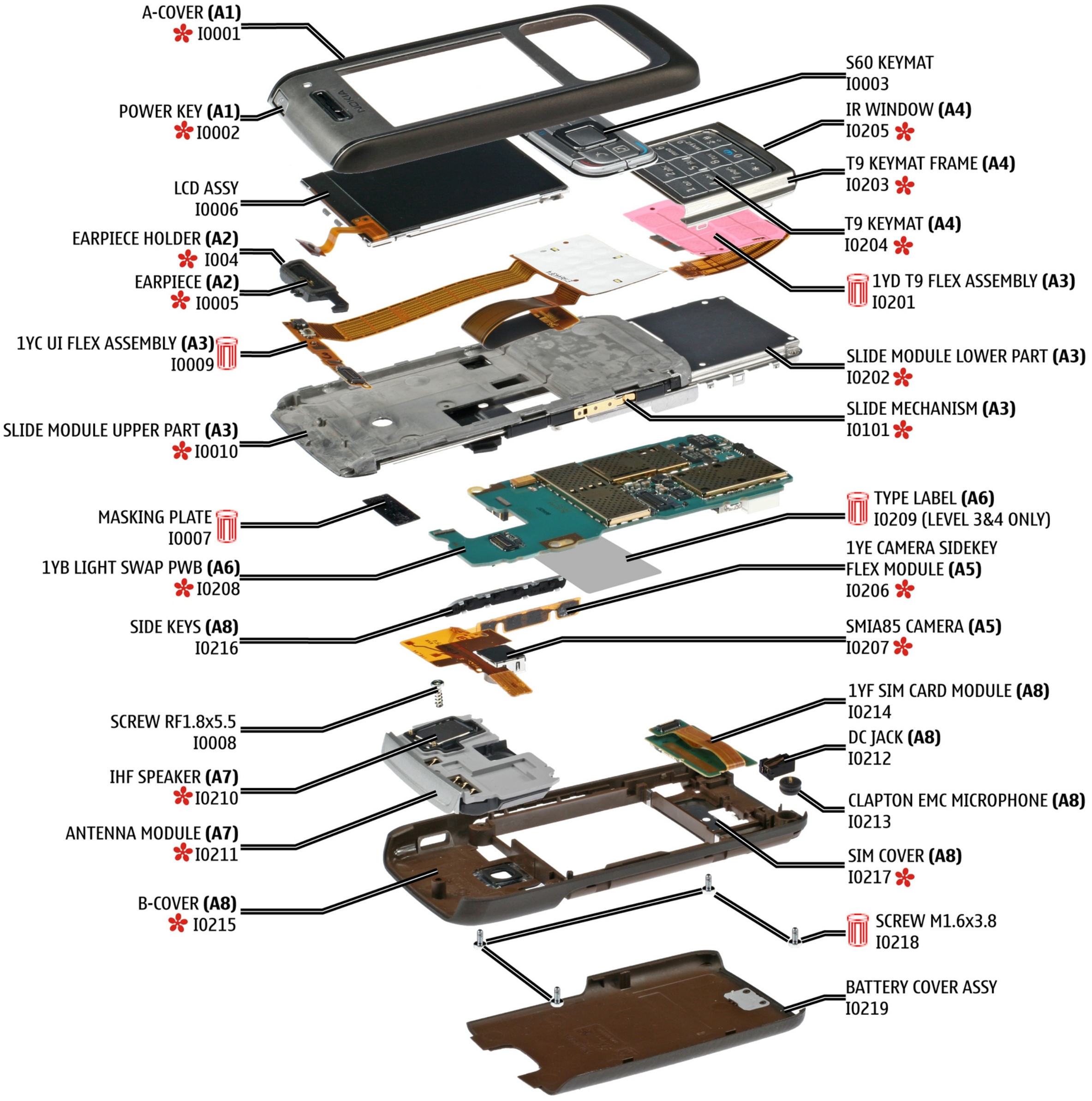
Exploded view

Exploded view

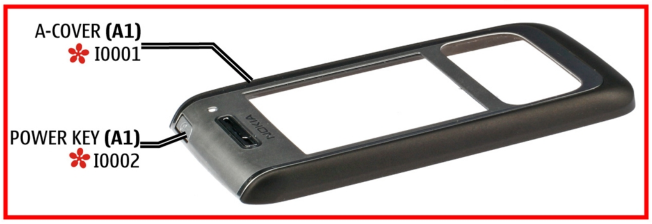

A-COVER **(A1)**
✱ I0001
POWER KEY **(A1)**
✱ I0002
LCD ASSY
I0006
EARPIECE HOLDER **(A2)**
✱ I004
EARPIECE **(A2)**
✱ I0005
1YC UI FLEX ASSEMBLY **(A3)** 🗑
I0009
SLIDE MODULE UPPER PART **(A3)**
✱ I0010
MASKING PLATE 🗑
I0007
1YB LIGHT SWAP PWB **(A6)**
✱ I0208
SIDE KEYS **(A8)**
I0216
SCREW RF1.8x5.5
I0008
IHF SPEAKER **(A7)**
✱ I0210
ANTENNA MODULE **(A7)**
✱ I0211
B-COVER **(A8)**
✱ I0215
S60 KEYMAT
I0003
IR WINDOW **(A4)**
I0205 ✱
T9 KEYMAT FRAME **(A4)**
I0203 ✱
T9 KEYMAT **(A4)**
I0204 ✱
🗑 1YD T9 FLEX ASSEMBLY **(A3)**
I0201
SLIDE MODULE LOWER PART **(A3)**
I0202 ✱
SLIDE MECHANISM **(A3)**
I0101 ✱
🗑 TYPE LABEL **(A6)**
I0209 (LEVEL 3&4 ONLY)
1YE CAMERA SIDEKEY
FLEX MODULE **(A5)**
I0206 ✱
SMIA85 CAMERA **(A5)**
I0207 ✱
1YF SIM CARD MODULE **(A8)**
I0214
DC JACK **(A8)**
I0212
CLAPTON EMC MICROPHONE **(A8)**
I0213
SIM COVER **(A8)**
I0217 ✱
🗑 SCREW M1.6x3.8
I0218
BATTERY COVER ASSY
I0219

🗑 = These parts can not be reused after removal.

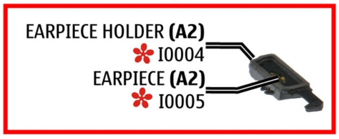
✱ = only available as assembly

Spare parts overview

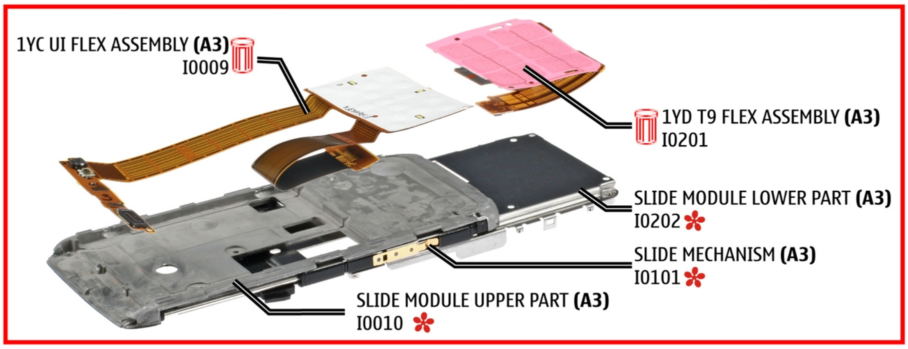
A1=A-COVER ASSY (I0001-I0002)

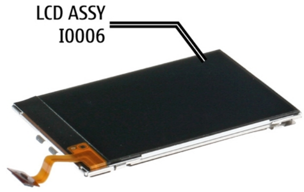

A-COVER **(A1)**
✽ I0001
POWER KEY **(A1)**
✽ I0002

A2=EARPIECE HOLDER ASSY (I0004-I0005)

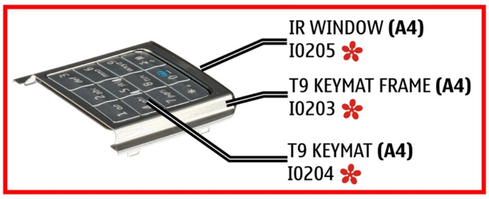

EARPIECE HOLDER **(A2)**
✽ I0004
EARPIECE **(A2)**
✽ I0005

A3=SLIDE MODULE ASSY (I0009-I0010, I0201-I0202)

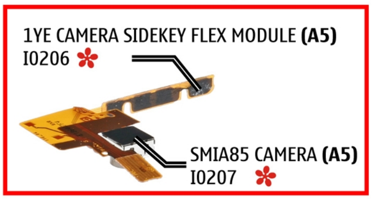

1YC UI FLEX ASSEMBLY **(A3)** 🗑
I0009
🗑 1YD T9 FLEX ASSEMBLY **(A3)**
I0201
SLIDE MODULE LOWER PART **(A3)**
I0202 ✽
SLIDE MECHANISM **(A3)**
I0101 ✽
SLIDE MODULE UPPER PART **(A3)**
I0010 ✽

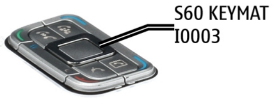

LCD ASSY
I0006

A4=T9 KEYMAT ASSY (I0203-I0205)

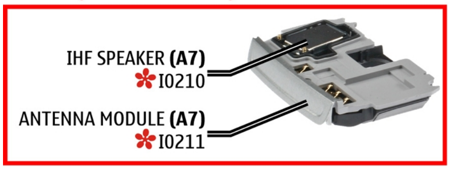

IR WINDOW **(A4)**
I0205 ✽
T9 KEYMAT FRAME **(A4)**
I0203 ✽
T9 KEYMAT **(A4)**
I0204 ✽

A5=CAMERA FLEX ASSY (I0206-I0207)

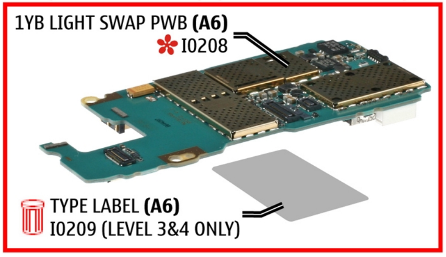

1YE CAMERA SIDEKEY FLEX MODULE **(A5)**
I0206 ✽
SMIA85 CAMERA **(A5)**
I0207 ✽

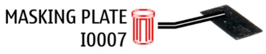

S60 KEYMAT
I0003

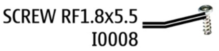
A7=ANTENNA MODULE ASSY (I0210-I0211)

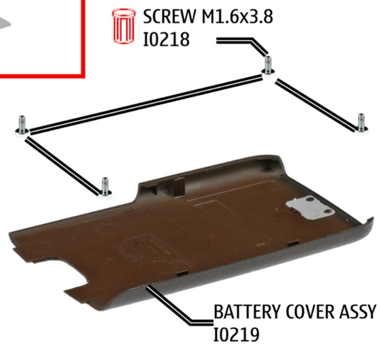

IHF SPEAKER **(A7)**
✽ I0210
ANTENNA MODULE **(A7)**
✽ I0211

A6=1YB LIGHT SWAP PACKAGE (I0208-I0209) (LEVEL 3&4 ONLY)

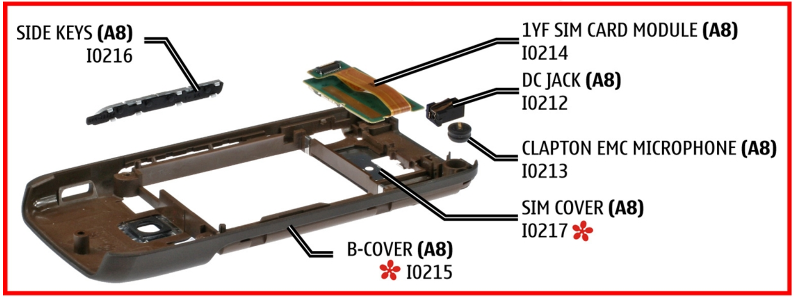

1YB LIGHT SWAP PWB **(A6)**
✽ I0208
🗑 TYPE LABEL **(A6)**
I0209 (LEVEL 3&4 ONLY)


MASKING PLATE 🗑
I0007


SCREW RF1.8x5.5
I0008


🗑 SCREW M1.6x3.8
I0218
BATTERY COVER ASSY
I0219

A8=B-COVER ASSY (I0212-I0217)


SIDE KEYS **(A8)**
I0216
1YF SIM CARD MODULE **(A8)**
I0214
DC JACK **(A8)**
I0212
CLAPTON EMC MICROPHONE **(A8)**
I0213
SIM COVER **(A8)**
I0217 ✽
B-COVER **(A8)**
✽ I0215

🗑 = These parts can not be reused after removal.

✽ = only available as assembly

Ver. 2.0

Parts lists

Mechanical spare parts list

RM-208 mechanical parts list

ITEM/ CIRCUIT REF.	QTY	SPARE PART DESCRIPTION	NOTE	ACT.	LEVEL	NAM	LTA	EU	MEA	APAC	CHINA
A1	1	A-COVER ASSY (I0001 - I0002)		-	1						
I0001	1	A-COVER		MR	-						
I0002	1	POWER KEY		MR	-						
I0003	1	S60 KEYMAT		MR	1						
A2	1	EARPIECE HOLDER ASSY (I0004 - I0005)		-	1						
I0004	1	EARPIECE HOLDER		MR	-						
I0005	1	EARPIECE		MR	-						
I0006	1	LCD ASSY		MR	1						
I0007	1	MASKING PLATE		MR	1						
I0008	1	SCREW RF1.8x5.5		MR	1						
A3	1	SLIDE MODULE ASSY (I0009-I0010, I0101, I0201-I0202)		-	1						
I0009	1	1YC UI FLEX ASSEMBLY	Cannot be reused when removed	MR	1						
I0010	1	SLIDE MODULE UPPER PART		MR	-						
I0101	1	SLIDE MECHANISM		MR	-						

ITEM/ CIRCUIT REF.	QTY	SPARE PART DESCRIPTION	NOTE	ACT.	LEVEL	NAM	LTA	EU	MEA	APAC	CHINA
I0201	1	1YD T9 FLEX ASSEMBLY	Cannot be reused when removed	MR	1						
I0202	1	SLIDE MODULE LOWER PART		MR	-						
A4	1	T9 KEYMAT ASSY (I0203-I0205)		-	1						
I0203	1	T9 KEYMAT FRAME		MR	-						
I0204	1	T9 KEYMAT		MR	-						
I0205	1	IR WINDOW		MR	-						
A5	1	CAMERA FLEX ASSY (I0206 - I0207)		-	1						
I0206	1	1YE CAMERA SIDEKEY FLEX MODULE		MR	1						
I0207	1	SMIA85 CAMERA		MR	-						
A6	1	1YB LIGHT SWAP PACKAGE (I0208-I0209)		-	3						
I0208	1	1YB LIGHT SWAP PWB		MS	-						
I0209	1	TYPE LABEL	Cannot be reused when removed	MR	3						
A7	1	ANTENNA MODULE ASSY (I0210 - I0211)		-	1						
I0210	1	IHF SPEAKER		MR	-						
I0211	1	ANTENNA MODULE		MR	-						

ITEM/ CIRCUIT REF.	QTY	SPARE PART DESCRIPTION	NOTE	ACT.	LEVEL	NAM	LTA	EU	MEA	APAC	CHINA
A8	1	B-COVER ASSEMBLY (I0212 - I0217)		-	1						
I0212	1	DC-JACK		MR	1						
I0213	1	CLAPTON EMC MICROPHONE		MR	1						
I0214	1	1YF SIM CARD MODULE		MR	1						
I0215	1	B-COVER		MR	-						
I0216	1	SIDE KEYS		MR	-						
I0217	1	SIM COVER		MR	-						
I0218	4	SCREW M1.6x3.8	Cannot be reused when removed	MR	1						
I0219	1	BATTERY COVER ASSY		MO	1						

RM-208 component parts list

Component parts list (1yb-07a)

Note: For Nokia product codes, please refer to the latest Service Bulletins on the Partner Website (PWS). To ensure you are always using the latest codes, please check the PWS on a daily basis.

Item	Side	Grid ref.		Description and value		
A1500	Bottom	B	18	SHIELD_CAMERA_ACC	CAMERA ACC SHIELD 040-031706	~
A2800	Top	G	7	SHIELD_RAP_3G	RAP 3G SHIELD 040-031712	~
A5000	Top	C	3	SHIELD_COMBO	COMBO SHIELD 040-031714	~
A6000	Bottom	E	4	SHIELD_BT_WLAN	WLAN BT SHIELD 040-031708	~
A7500	Top	E	11	SHIELD_040_022072	RA-6 RF-SHIELD 040-035290	~
B2200	Top	F	5	CRYSTAL_FC_135	CRYSTAL 32.768KHZ +-20PPM 12.5PF	32.768 kHz

Item	Side	Grid ref.		Description and value		
C1550	Bottom	C	17	0402C	Chipcap 5% NP0	27p
C1554	Top	C	17	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C1555	Top	C	17	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C1556	Top	C	17	0402C	Chipcap 5% NP0	27p
C1557	Bottom	B	18	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C1558	Bottom	B	18	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C1559	Bottom	C	18	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C1563	Bottom	B	18	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C1564	Bottom	B	18	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
C1566	Bottom	B	16	0402C	Chipcap X7R 10% 16V 0402	10n
C1567	Top	D	9	0402C	Chipcap X7R 10% 16V 0402	10n
C1568	Top	E	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C1569	Top	D	9	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C1570	Bottom	C	16	0402C	Chipcap X7R 10% 16V 0402	10n
C1571	Bottom	C	16	0402C	Chipcap X7R 10% 16V 0402	10n
C1575	Bottom	C	18	0402C	Chipcap 5% NP0	27p
C2000	Bottom	E	2	0402C	Chipcap 5% NP0	27p
C2001	Bottom	D	2	0603C_H0.95	CHIPCAP X5R 470N K 25V 0603	470n
C2005	Bottom	F	2	0402C	Chipcap X7R 10% 16V 0402	10n
C2006	Bottom	G	2	0402C	Chipcap X7R 10% 16V 0402	10n
C2071	Top	H	13	TANT_C_6.2X3.4_H1.7	CHIPTCAP 150U M 10V 6X3.2X1.5	150u_10V
C2201	Top	G	5	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5

Item	Side	Grid ref.		Description and value		
C2202	Top	C	9	0402C	Chipcap X7R 10% 50V 0402	1n0
C2203	Top	C	9	0402C	Chipcap X7R 10% 50V 0402	1n0
C2204	Top	C	9	0402C	Chipcap X7R 10% 50V 0402	1n0
C2205	Top	F	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2211	Top	H	5	0805C	CHIPCAP X5R 4U7 K 10V 0805	4u7
C2213	Top	F	5	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5
C2215	Top	G	5	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5
C2216	Top	F	5	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2217	Top	G	6	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C2220	Top	H	6	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5
C2222	Top	H	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2225	Top	E	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2226	Top	F	5	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2227	Top	F	5	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5
C2228	Top	E	4	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5
C2231	Top	H	6	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
C2232	Top	H	5	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5
C2235	Top	F	6	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2

Item	Side	Grid ref.		Description and value		
C2236	Top	F	6	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C2237	Top	G	4	0402C	Chipcap X7R 10% 50V 0402	1n0
C2238	Top	H	9	0402C	Chipcap X7R 10% 50V 0402	1n0
C2242	Top	E	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2243	Top	E	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2244	Top	E	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2245	Top	E	6	0402C	Chipcap 5% NP0	68p
C2246	Top	E	6	0402C	Chipcap 5% NP0	68p
C2247	Bottom	C	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C2248	Top	G	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2249	Top	G	6	0402C	Chipcap X7R 10% 50V 0402	1n0
C2300	Top	G	3	0402C	Chipcap X7R 10% 16V 0402	10n
C2301	Top	G	3	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2302	Top	H	4	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2303	Top	F	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2304	Top	G	4	0402C	Chipcap X7R 10% 16V 0402	10n
C2307	Top	F	3	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C2309	Top	G	3	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C2312	Top	F	3	0405_DUAL	CHIPCAP NETWORK X5R 2X1U5 K 6V3 0405	2x1u5
C2314	Top	D	7	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7
C2315	Top	C	7	0805C	CHIPCAP X5R 4U7 M 25V 0805	4u7

Item	Side	Grid ref.		Description and value		
C2316	Top	F	4	0402C	Chipcap 5% NP0	100p
C2317	Top	F	4	0402C	Chipcap 5% NP0	100p
C2800	Top	G	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2801	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2802	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2803	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2804	Top	H	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2805	Top	H	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2806	Top	G	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2807	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2808	Top	G	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2809	Top	G	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2810	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2811	Top	F	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2812	Top	G	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2813	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2814	Top	H	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2815	Top	F	9	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2816	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2817	Top	H	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2818	Top	F	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n

Item	Side	Grid ref.		Description and value		
C2819	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2820	Top	H	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2821	Top	F	7	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C2822	Top	F	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4200	Top	E	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C4201	Top	E	8	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C4202	Top	E	8	0402C	Chipcap X7R 10% 16V 0402	10n
C4400	Top	C	8	0402C	Chipcap 5% NP0	27p
C4401	Top	G	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4402	Top	D	8	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4403	Top	B	9	0402C	Chipcap 5% NP0	27p
C4404	Top	E	9	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C4405	Top	E	9	0402C	Chipcap X7R 10% 50V 0402	1n0
C4406	Top	F	2	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C4407	Top	F	1	0402C	Chipcap 5% NP0	27p
C4408	Top	F	1	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4409	Top	C	6	0402C	Chipcap 5% NP0	27p
C4410	Top	C	7	0402C	Chipcap 5% NP0	27p
C4411	Top	A	9	0402C	Chipcap 5% NP0	27p
C4800	Top	A	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4801	Top	D	6	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C4802	Top	A	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4803	Top	D	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n

Item	Side	Grid ref.		Description and value		
C4804	Top	C	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4805	Top	D	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4806	Top	C	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4807	Top	A	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4808	Top	D	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4809	Top	A	6	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4810	Top	D	5	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4811	Top	B	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4812	Top	A	4	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C4813	Top	D	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C5000	Top	C	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C5001	Top	E	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C5002	Top	A	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C5003	Top	D	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C5004	Top	A	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C5005	Top	A	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C5006	Top	D	4	0603C	CHIPCAP X5R 1U K 6V3 0603	1u0
C5201	Bottom	I	3	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C5202	Bottom	H	2	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C5203	Bottom	H	2	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n

Item	Side	Grid ref.		Description and value		
C5204	Bottom	I	3	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C5205	Top	E	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C5206	Top	E	5	0402C	Chipcap X7R 10% 50V 0402	1n0
C6030	Bottom	G	3	0402C	Chipcap 5% NP0	100p
C6031	Bottom	F	3	0402C	Chipcap 5% NP0	15p
C6033	Bottom	G	3	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C6036	Bottom	G	4	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C6037	Bottom	G	4	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6038	Bottom	G	4	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6039	Bottom	G	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6040	Bottom	G	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6041	Bottom	H	3	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47
C6042	Bottom	G	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6043	Bottom	G	4	0402C	CHIPCAP X5R 0U47 K 6.3V 0402	0u47
C6044	Bottom	F	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6045	Bottom	G	5	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0
C6051	Bottom	G	5	0402C	Chipcap 5% NP0	10p
C6300	Bottom	E	5	0805C	CHIPCAP X5R 22U M 6V3 0805	22u
C6301	Bottom	E	5	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C6303	Bottom	E	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C6305	Bottom	A	4	0402C	CHIPCAP NP0 0P5 C 50V 0402	0p5
C6307	Bottom	E	3	0402C	CHIPCAP X5R 1U K 6V3 0402	1u0

Item	Side	Grid ref.		Description and value		
C6308	Bottom	D	3	0402C	Chipcap +-0.25pF NP0	6p8
C6328	Bottom	C	5	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6329	Bottom	C	5	0402C	Chipcap 5% NP0	12p
C6330	Bottom	D	5	0603C	CHIPCAP X5R 2U2 K 6V3 0603	2u2
C6331	Bottom	E	5	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C6335	Bottom	D	5	0402C	CHIPCAP NP0 220P J 25V 0402	220p
C6338	Bottom	C	5	0402C	Chipcap 5% NP0	47p
C6350	Bottom	F	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6351	Bottom	F	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6352	Bottom	F	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6353	Bottom	F	4	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6354	Bottom	E	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6360	Bottom	D	3	0402C	CHIPCAP X5R 100N K 10V 0402	100n
C6396	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	6p8
C6397	Bottom	C	4	0402C	Chipcap +-0.25pF NP0	6p8
C6398	Bottom	D	4	0402C	Chipcap +-0.25pF NP0	6p8
C6399	Bottom	D	4	0402C	Chipcap +-0.25pF NP0	6p8
C7500	Top	H	11	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
C7507	Top	G	11	0402C	Chipcap X7R 10% 16V 0402	10n
C7513	Top	H	11	0402C	Chipcap X7R 10% 25V 0402	4n7
C7518	Top	G	10	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n

Item	Side	Grid ref.		Description and value		
C7519	Top	H	10	0402C	CHIPCAP X5R 1U5 K 4V 0402	1u5
C7520	Top	H	10	0402C	Chipcap 5% X7R	1n0
C7521	Top	D	10	0402C	Chipcap +-0.25pF NP0	3p3
C7523	Top	D	12	0402C	Chipcap +-0.25pF NP0	3p3
C7524	Top	E	10	0402C	Chipcap 5% NP0	27p
C7525	Top	E	10	0402C	Chipcap 5% NP0	10p
C7531	Bottom	E	19	0402C	Chipcap +-0.25pF NP0	8p2
C7532	Bottom	E	19	0402C	Chipcap +-0.25pF NP0	1p8
C7533	Bottom	D	19	0402C	Chipcap 5% NP0	100p
C7536	Bottom	C	16	0402C	Chipcap 5% NP0	12p
C7537	Bottom	C	16	0402C	Chipcap 5% NP0	12p
C7543	Top	C	11	0603C	CHIPCAP X5R 4U7 K 6V3 0603	4u7
C7544	Top	B	11	0402C	CERCAP X7R 22N K 16V 0402	22n
C7545	Top	B	11	0402C	Chipcap 5% NP0	10p
C7547	Top	B	10	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
C7548	Top	B	11	0402C	Chipcap X7R 10% 16V 0402	8n2
C7549	Top	C	11	0402C	Chipcap X7R 10% 16V 0402	8n2
C7550	Top	B	10	0402C	Chipcap 5% X7R	1n0
C7553	Top	C	11	0402C	Chipcap 5% X7R	1n0
C7580	Top	H	10	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C7581	Top	H	10	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C7582	Top	H	10	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C7583	Top	H	10	0402C_H0.6	CHIPCAP X5R 100N K 16V 0402	100n
C7586	Top	F	10	0402C	Chipcap 5% NP0	10p
C7587	Top	F	10	0402C	Chipcap 5% NP0	10p

Item	Side	Grid ref.		Description and value		
C7590	Top	F	12	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
C7591	Top	F	11	0603C	CHIPCAP X5R 10UF 6V3 0603	10u
D1550	Bottom	B	17	TFBGA84	HW ACCELERATOR STV0984N	~
D2800	Top	G	8	VFBGA343	RAP3GS V2.0E-PA VFBGA	~
D2801	Top	G	8	FBGA128_EMPTY	COMBO 128M NOR +128M DDR DRAM FBGA128	8Mx16 / 8Mx16
D4400	Top	D	8	XBGA_N5_H0.625	1X1-IN AND 1.8V 74AUC1G08 WCSP-5	~
D4800	Top	C	5	uBGA_289	HELEN3 PS2.0 N3 F761909 C27 UBGA289	~
D5000	Top	C	2	FBGA133_11.6X13.1	COMBO 512 DDR + 1G NAND FBGA133 PBFREE	32Mx16/128 Mx8
D6030	Bottom	G	4	XBGA_N5_H0.625	OR-GATE 2INPUT 74LVC1G32YZTR WCSP-5	~
E1500	Top	G	15	SMT_EMI_GASKET_13	25SMT-3645-13 T and R330MM	~
E1501	Top	E	19	SMT_EMI_GASKET_13	25SMT-3645-13 T and R330MM	~
E1502	Bottom	B	5	SMT_EMI_GASKET_41	25SMT-3645-41 T and R330MM	~
E1503	Bottom	H	5	SMT_EMI_GASKET_41	25SMT-3645-41 T and R330MM	~
E7500	Bottom	B	20	SK200400122	SM CONN SPACER PAD 2.0X2.0	~
E7501	Bottom	B	20	CONTACT_PAD_2.95 X1.95	SM CONN VIBRA SPACER PAD 2.8X1.8	~
E7502	Bottom	C	20	CONTACT_PAD_2.95 X1.95	SM CONN VIBRA SPACER PAD 2.8X1.8	~
E7531	Bottom	E	20	SK200400122	SM CONN SPACER PAD 2.0X2.0	~
F2000	Bottom	C	2	0603_FUSE_AVX2MATS	SM FUSE F 2.0A 32V	2A

Item	Side	Grid ref.		Description and value		
G2200	Top	E	3	BATTER_EECEP	RTC BACUP CAPAC 311 SIZE FOR 2.6V 4UAH	2.6V
G6030	Bottom	G	5	VCTCXO_3.4X2.7_4P2_H1.0	TCXO 38.4MHZ +-10PPM 2.78V	38.4MHz
G7501	Top	H	12	NKG3176B_H1.0	VCTCXO 38.4MHZ 2.5V 2MA	38.4MHz
L1553	Bottom	C	18	CHOKE_SER300	CHOKE 1U 0R1 1.5A 3.0X3.0X1.0	1uH
L2000	Bottom	D	2	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2001	Bottom	F	2	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2002	Bottom	G	2	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2003	Bottom	G	2	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2202	Top	E	4	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2205	Top	H	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2206	Top	B	7	0405_2_H1.0	CHIP BEAD ARRAY 2X1000R 0405	2x1000R/100MHz
L2207	Top	F	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2208	Top	F	6	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2209	Top	H	6	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100MHz

Item	Side	Grid ref.		Description and value		
L2210	Top	H	6	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100MHz
L2301	Top	G	3	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L2302	Top	G	4	CHOKE_SER400_H1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH
L2304	Top	D	7	CHOKE_SER300_H1.5	CHOKE 22U M 0R7 0.35A 3.0x3.0x1.5	22uH
L4200	Top	E	7	CHOKE_SER400_H1.2	INDUCT WW 10UH 0A65 0R35 4X4X1.2	10uH
L4201	Top	E	9	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L4400	Top	F	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
L4401	Top	C	8	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
L4402	Top	B	9	0603_BLM	FERRITE BEAD 0R5 600R/100MHZ 0603	600R/100MHz
L4403	Top	C	8	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
L6030	Bottom	F	3	0402L	CHIP COIL 22N J Q28/800M 0402	22nH
L6306	Bottom	B	3	0402L	CHIP COIL 3N9 +-0N3 Q28/800M 0402	3n9H
L7500	Top	G	10	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7501	Top	F	11	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7502	Top	G	12	0603_BLM	FERR.BEAD 220R/100M 2A 0R05 0603	220R/100MHz
L7503	Top	G	10	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100MHz

Item	Side	Grid ref.		Description and value		
L7506	Top	H	12	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100MHz
L7510	Top	D	12	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz
L7526	Top	F	10	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100MHz
L7530	Bottom	E	19	0402L	CHIP COIL 6N8 J Q27/800M 0402	6n8H
L7540	Top	C	10	CHOKE_SER300_H1.5	CHOKE 3U3 1.2A 0R096 3X3X1.5	3u3H
L7550	Top	B	10	0402L	FERR.BEAD 240R7100M 0.4A 0R4 0402	240R/100MHz
L7588	Top	G	11	0402L	CHIP COIL 12N J Q31/800M 0402	12nH
L7589	Top	G	12	0402L	CHIP COIL 6N8 J Q27/800M 0402	6n8H
L7590	Top	F	12	INDUCTOR_MDT2520	INDUCT ML CHIP PWR 3U3 M 0R15 0.2A	3u3H
L7591	Top	B	10	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz
L7592	Top	F	11	FERRITE_FBMJ1608	FERRITE BEAD 0R01 28R/100MHZ 0603	28R/100MHz
M2200	Bottom	B	4	VIBRA_M_KHN4NX1RA	SMD VIBRA MOTOR 1.3V 80MA 9000RPM	~
N1551	Top	D	9	USMD5_1.47X1.04_H0.675	VREG LP3985ITLX-2.8 NOPB USMD5	~
N1552	Bottom	B	18	USMD5_1.518X1.137	DC/DC CONV 1.8V 600MA 3MHZ WLCSP5	~
N2200	Top	G	6	TFBGA_105	AVILMA 1.05C BB MODULE TFBGA105	~
N2300	Top	F	3	TFBGA64_H1.2	BETTY V2.1 & V2.2 LFA TFBGA64	~

Item	Side	Grid ref.		Description and value		
N2301	Top	D	7	USMD8_1.69X1.69	WHITE LED DRIVER 4LEDS 500MW 8BUMP USMD8	~
N4200	Top	E	8	USMD_10_2.458X1.899	DC/DC CONV LM3661-1.40V/1.05V NOPB	~
N4400	Top	G	2	SOT_666	TRX2+RX4 PEMD9 N &P 10K/47K 0W12 SOT666	~
N4401	Top	H	2	D381A	POWER IC D381A 5X7 QFN	~
N4402	Top	E	9	SH248CSP	HALL IC SWITCH SH248CSP VCC	~
N4403	Top	F	1	IRDA_TFBS_GP2W_CIM	IRDA MIR XSMALL	~
N4404	Top	B	9	CSP_8_2.118X1.118	IC ANALOG SWITCH SPDT LOW THRESHOLD CSP8	~
N5200	Bottom	H	3	BGA24_2.58X2.58_P0.4	LEVEL SHIFTER SD/MMC 24BGA	~
N6030	Bottom	G	3	uBGA63_4.6X4.6	BRF6150	~
N6031	Bottom	G	5	FC_4_0.99X0.99	LI VREG TK63128B 2.8V WLCSP4	~
N6300	Bottom	E	4	LFBGA240	WLAN MCM STLC4550 LFBGA240	~
N6301	Bottom	D	4	RF5924	WLAN RF5924 ES3.5	~
N7505	Top	G	11	TFBGA144	AHNEUS204A TFBGA144	~
N7520	Top	D	11	RF9283E1.2	PW AMP GSM/EDGE 850/900/1800/1900	~
N7530	Bottom	D	19	SC70_6_FAIR	HIGH POWER SPDT RF SW SC70	~
N7540	Top	B	11	PW_AMP_RF3278E4.1	PW AMP WCDMA 824-915/1710-1980MHZ	~
N7541	Top	B	10	USMD8_1.85X1.70	DC/DC CONV LMX3206TLX uSMD8	~
N7590	Top	F	12	uBGA8_1.849X1.696	DC CONV LM3202TLX NOPB REVB USMD8	~
R1500	Top	D	5	0402R	CHIPRES 0W06 10K F 0402	10k

Item	Side	Grid ref.		Description and value		
R1550	Top	B	17	0402R	Resistor 5% 63mW	4k7
R1551	Top	B	17	0402R	Resistor 5% 63mW	4k7
R1555	Top	C	6	0402R	Resistor 5% 63mW	100R
R1556	Top	B	6	0402R	Resistor 5% 63mW	100R
R1557	Bottom	C	16	0402R	Resistor 5% 63mW	100R
R1558	Bottom	C	17	0402R	Chipres 0W06 jumper 0402	0R
R1561	Bottom	B	16	0402R	Resistor 5% 63mW	100R
R1567	Bottom	C	17	0402R	Resistor 5% 63mW	4k7
R1573	Bottom	C	17	0402R	Resistor 5% 63mW	4k7
R1574	Bottom	B	16	0402R	Resistor 5% 63mW	4k7
R1575	Bottom	B	18	0402R	Resistor 5% 63mW	220k
R1578	Top	D	9	0603R	CHIPRES JUMPER 0603	0R
R2000	Bottom	G	2	0402R	Resistor 5% 63mW	10R
R2001	Bottom	F	2	0402R	Resistor 5% 63mW	10R
R2002	Bottom	F	2	0402_VAR	CHIP VARISTOR VWM5.6V VC15.5 0402	5.6V/ 15V/ 0.05J
R2003	Bottom	F	2	0402_VAR	CHIP VARISTOR VWM5.6V VC15.5 0402	5.6V/ 15V/ 0.05J
R2004	Bottom	E	2	0402R	Resistor 5% 63mW	100R
R2006	Bottom	H	2	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~
R2007	Bottom	F	2	uBGA11_1.6X2.15	ASIP SILIC USB OTG / ESD BGA11	~
R2010	Bottom	E	2	0402R	Resistor 5% 63mW	220k
R2015	Bottom	D	2	BGA_4	ASIP TVS BGA4	~
R2070	Bottom	G	15	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/ 50V
R2071	Bottom	H	5	0402_NTH5	NTC RES 47K J B=4050+-3% 0402	47k
R2200	Top	G	6	0402R	Resistor 5% 63mW	1k0
R2201	Top	G	6	0402R	Chipres 0W06 jumper 0402	0R

Item	Side	Grid ref.		Description and value		
R2202	Top	C	9	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2203	Top	C	9	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2204	Top	C	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2205	Top	C	17	0402_VAR	CHIP VARISTOR VWM14V VC50V 0402	14V/50V
R2206	Top	F	6	0402R	Resistor 5% 63mW	27k
R2300	Top	H	12	CURRENT_SEN_0R01_D1J	CHIPRES 0W1 0R01 J 0603	0R01
R2302	Top	H	4	0402R	Resistor 5% 63mW	100R
R2303	Top	D	8	0402R	Resistor 5% 63mW	33R
R2800	Top	G	7	0402R	Resistor 5% 63mW	10R
R2801	Top	F	9	0402R	Resistor 5% 63mW	4k7
R2802	Top	F	7	0402R	Resistor 5% 63mW	4k7
R2803	Top	H	7	0402R	Resistor 5% 63mW	4k7
R4400	Top	F	2	0402R	Resistor 5% 63mW	220k
R4401	Top	E	9	0402R	Resistor 5% 63mW	100k
R4402	Top	G	2	0402R	Resistor 5% 63mW	27k
R4403	Top	E	2	0805R_THERM1	CHIPRES 0W125 4R7 J 0805	4R7
R4404	Top	D	9	0402R	Resistor 5% 63mW	100R
R4405	Top	D	9	0402R	Resistor 5% 63mW	470R
R4410	Top	C	6	0402R	Resistor 5% 63mW	4k7
R4413	Top	H	1	0402R	Chipres 0W06 jumper 0402	0R
R4800	Top	A	5	0402R	Resistor 5% 63mW	10R
R4801	Bottom	F	5	0402R	Resistor 5% 63mW	47R
R4802	Bottom	F	5	0402R	Resistor 5% 63mW	47R
R4809	Top	E	5	0402R	Resistor 5% 63mW	1k0
R5206	Bottom	I	2	0402R	Resistor 5% 63mW	100k
R6054	Bottom	F	4	0402R	Resistor 5% 63mW	100k
R6055	Bottom	F	5	0402R	Resistor 5% 63mW	100k

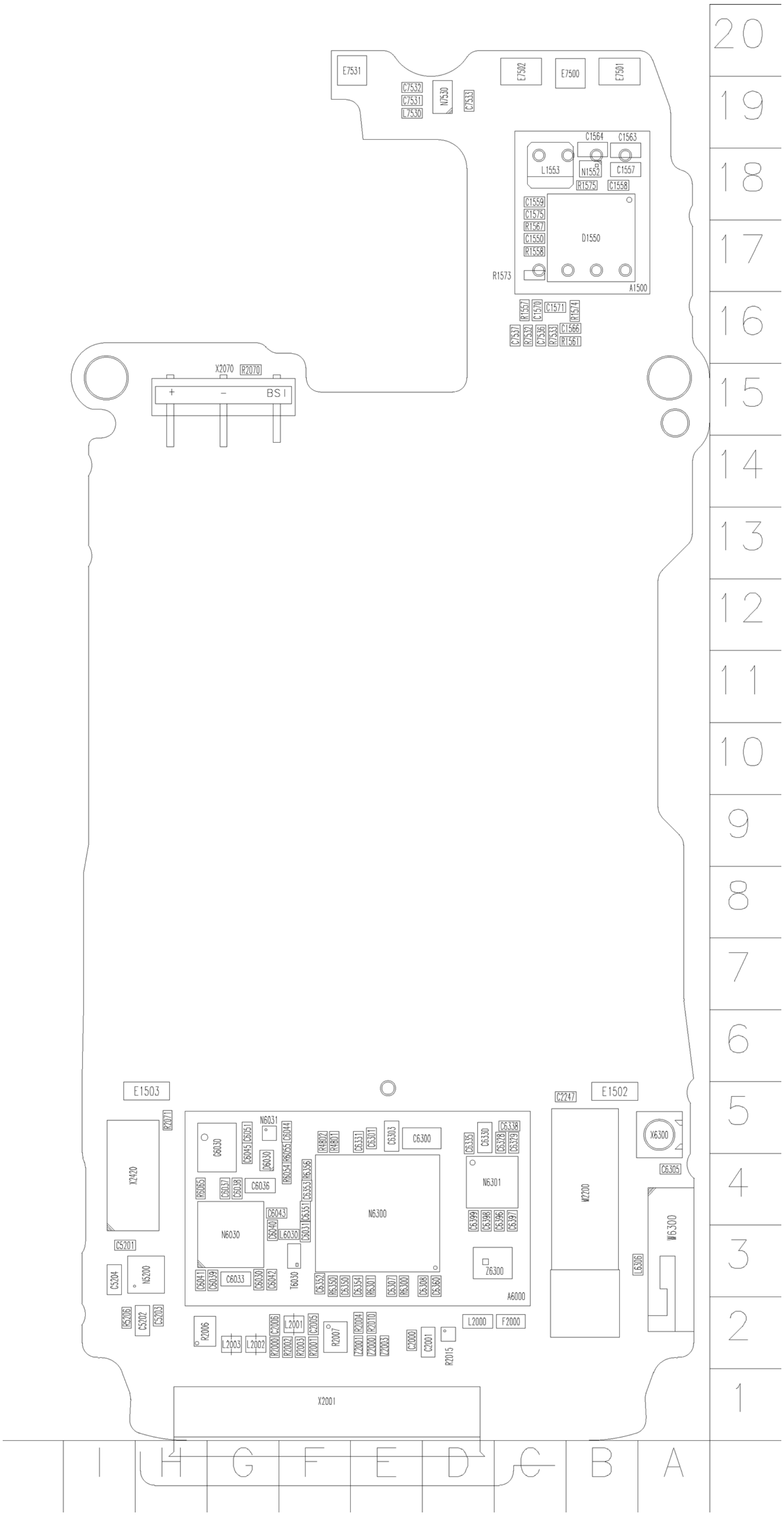
Item	Side	Grid ref.		Description and value		
R6065	Bottom	H	4	0402R	Resistor 5% 63mW	10k
R6300	Bottom	E	3	0402R	CHIPRES 0W06 1M F 100PPM 0402	1M0
R6301	Bottom	E	3	0402R	Resistor 5% 63mW	10k
R6350	Bottom	F	3	0402R	Resistor 5% 63mW	100R
R6356	Bottom	F	4	0402R	Chipres 0W06 jumper 0402	0R
R7501	Top	H	11	0402R	Resistor 5% 63mW	10R
R7502	Top	H	10	0402R	CHIPRES 0W06 10K F 0402	10k
R7503	Top	G	10	0402R	Resistor 5% 63mW	4k7
R7509	Top	H	11	0402R	Resistor 5% 63mW	22k
R7521	Top	E	10	0402R	Chipres 0W06 jumper 0402	0R
R7522	Top	G	11	0402R	Resistor 5% 63mW	18k
R7528	Top	E	12	0402R	Resistor 5% 63mW	10R
R7529	Top	D	12	0402R	Resistor 5% 63mW	470R
R7530	Top	D	12	0402R	Resistor 5% 63mW	470R
R7532	Bottom	C	16	0402R	Resistor 5% 63mW	470R
R7533	Bottom	C	16	0402R	Resistor 5% 63mW	470R
R7541	Top	B	10	0402R	CHIPRES 0W06 1K2 F 250PPM 0402	1k2
R7543	Top	B	11	0402R	Resistor 5% 63mW	10k
R7544	Top	B	10	0402R	Chipres 0W06 jumper 0402	0R
R7560	Top	C	10	0402R	Chipres 0W06 jumper 0402	0R
T6030	Bottom	F	3	TRANS_LDB10	BALUN 2450 +-50MHZ 1DB 1.7X0.9	~
T7502	Top	E	12	TRANS_HHM1726N1	TRANSF BALUN 1700-1900MHZ 0603	~
T7580	Top	F	10	TRANS_HHM1726N1	TRANSF BALUN 2.1GHZ 1.6X0.8MM	~
V2303	Top	H	3	SOD323F	SCH DI 30V 2A SOD323F	~
V4400	Top	D	8	SOT_666	TRX2+RX4 PEMD9 N & P 10K/47K 0W12 SOT666	~

Item	Side	Grid ref.		Description and value		
V4406	Top	D	9	VMT3	TR 2SC5658QRS N 50V 0A1 0W15 VMT3	~
W6300	Bottom	A	3	ANTENNA_NAN68_PC0400C	ANTENNA INT WLAN P2636 (3-PAD)	~
X1550	Top	B	17	JST_CN3_00514_200	CONN BTB 2X15 F P0.4 30V 0.2A	~
X2001	Bottom	F	1	SYSCON_MQ202_NK_14R3	SM SYSTEM CONNECTOR 14POL	~
X2070	Bottom	G	15	TYCO_0_1857071_1_V1	CONN BATT 3.5V 2A P3.7 H2.7MM	~
X2420	Bottom	I	4	MOLEX_51338_2274	CONN BTB F 2X11 P0.4	~
X4400	Top	C	9	MOLEX_SD_51338_0409	SM CONN B2B 2X20 F P0.4	~
X4401	Top	C	7	MOLEX_51338_9974	CONN BTB REC F P0.4 5.5x3.3x1.34	~
X4402	Top	G	1	SPRING_040_012210	SPRING CONTACT 012210 P2465	~
X4403	Top	G	1	SPRING_040_012210	SPRING CONTACT 012210 P2465	~
X6300	Bottom	A	5	COAX_MM8430	CONN SM COAX+ SW F 50R 250V 6GHZ	~
Z1550	Top	B	17	BGA11	ASIP 4 LINES AUDIO FILTER BGA11	~
Z2000	Bottom	E	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2001	Bottom	E	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z2003	Bottom	E	2	FERRITE_0402	FERRITE BEAD 0.6R 600R/100MHZ 0402	600R/100MHz
Z4400	Top	C	8	BGA24_P0.4_H0.67	ASIP 10-CH LCD FILTER W/ESD BGA24	~
Z4401	Top	B	8	BGA24_P0.4_H0.67	ASIP 10-CH LCD FILTER W/ESD BGA24	~
Z4402	Top	B	8	BGA24_P0.4_H0.67	ASIP 10-CH LCD FILTER W/ESD BGA24	~

Item	Side	Grid ref.		Description and value		
Z6300	Bottom	D	3	LFB2H2G45SGFB868	CER FILT 2450 +-50MHZ 2.5X2.0	2450MHz
Z7501	Top	F	10	FILTER_2.1X1.7_10P_H0.6	DUAL RX SAW FILTER 1800/1900MHZ 2016	1800/1900MHz
Z7503	Top	F	11	FILTER_SAW_LMSM32AA_422	TX SAW MODULE GSM 850/900MHZ	850/900MHz
Z7504	Top	F	11	EPCOS_LN82B_H0.45	SAW FILT 942.5 +-17.5/2.6 1.4X1.1X0.4MM	942.5 MHz
Z7521	Top	E	12	FILTER_LFTC10N	CER FILT LFL181699TC1 2400-2483MHZ 1.6	2400-2483MHz
Z7540	Top	C	12	DUPLEXER_3.2X2.7_H1.2	DUPL SAW 824-849/869-894MHZ 3.0X2.5X1.2	824-849/869-894MHz
Z7541	Top	C	11	DUPLEXER_3.2X2.7_H1.1	DUPL SAW 1920-1980/2110-2170 3.0X2.5X1.1	1920-1980/2110-2170MHz
Z7580	Top	F	10	FILTER_SXR967B3	SAW FILT 2140 +-30MHZ 1.4X1.1X0.5	2140MHz
Z7582	Top	G	12	FILTER_QCS10I_H0.78	SAW FILT DUAL 836.5/1950MHZ 3.0X1.6X0.68	836.5/1950MHz

Component layouts

Component layout - bottom (1yb-07a)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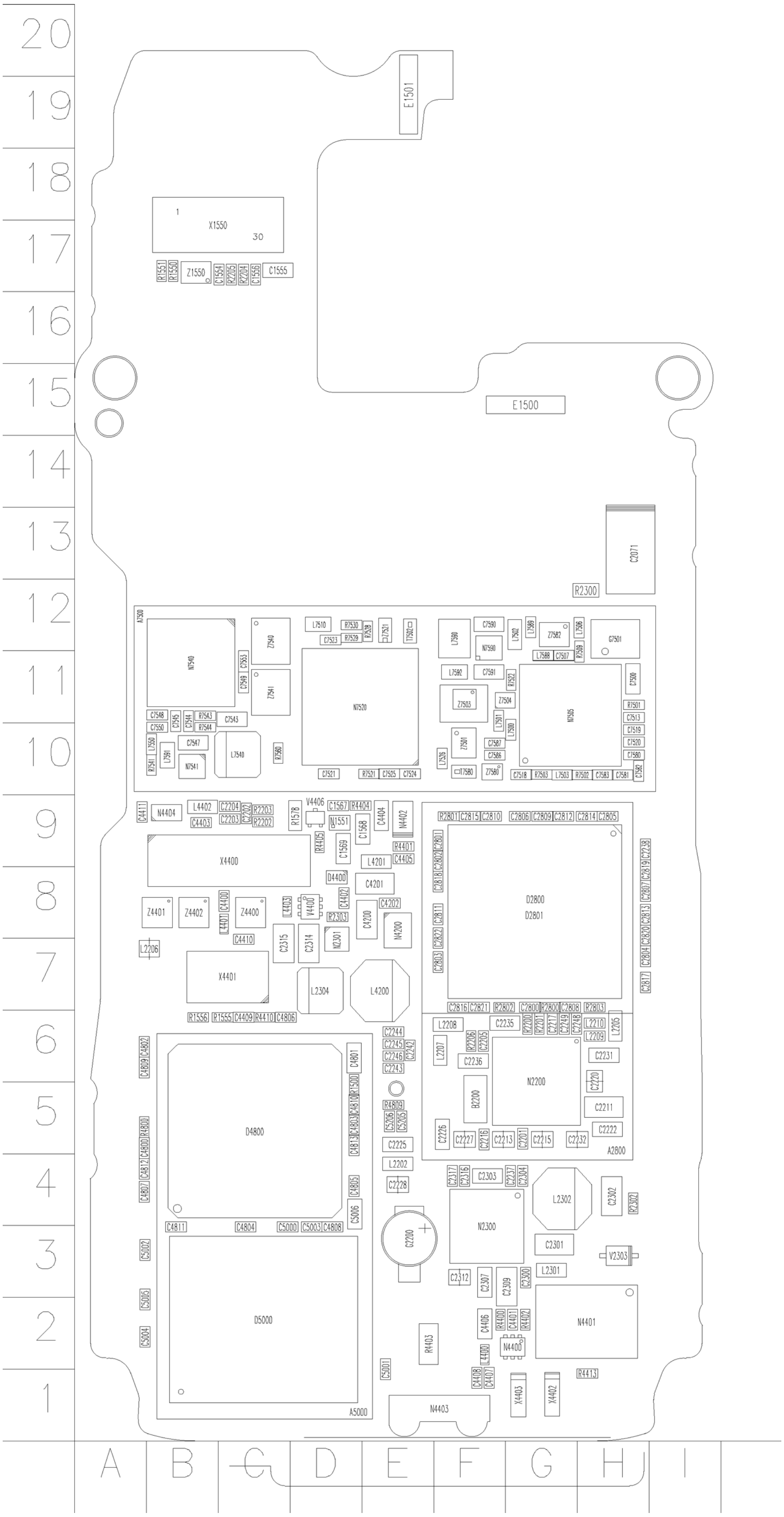
Component layout - top (1yb-07a)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D2801
N2200
B2200
L2208
C2235
C2236
L2207
L2210
L2209
L2205
C2231
C2220
C2211
C2222
A2800
D4800
D5000
A5000
C4811
C4804
C5000
C5003
C4808
C5006
C4801
C4805
C5001
G2200
N2300
C2303
L2302
C2302
R2302
C2301
L2301
V2303
N4401
N4400
R4403
N4403
X4403
X4402
R4413
C2225
L2202
C2228
C5002
C5005
C5004

3 — Service Software Instructions

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Phoenix installation steps in brief

Prerequisites

Recommended hardware requirements:

- Computer processor: Pentium 700 MHz or higher
- RAM 256 MB
- Disk space 100-300 MB

Supported operating systems:

- *Windows 2000* Service Pack 3 or higher
- *Windows XP* Service Pack 1 or higher

Context

Phoenix is a service software for reprogramming, testing and tuning phones.

Phoenix installation contains:

- Service software support for all phone models included in the package
- Flash update package files for programming devices
- All needed drivers for:
  - PKD-1 (DK2) dongle
  - DKU-2 or CA-53 USB cable

Note: Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless there are updates between *Phoenix* service software releases. If separate update packages are used, they should be used after *Phoenix* and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- Product software binary files
- Files for type label printing
- Validation file for the faultlog repair data reporting system
- All product specific configuration files for *Phoenix* software components

Note: *Phoenix* and phone data packages should only be used as complete installation packages. Uninstallation should be made from the *Windows* Control Panel.

To use *Phoenix*, you need to:

Steps

1. Connect a PKD-1 (DK2) dongle to the computer parallel port.
2. Install *Phoenix*.
3. Install the phone-specific data package.
4. Configure users.

5. Manage connection settings (depends on the tools you are using).

If you use FPS-10:	• Update FPS-10 software **Note:** There is no need to activate FPS-10. • Activate SX-4 smart card, if you need tuning and testing functions. **Note:** When FPS-10 is used only for product software updates, SX-4 smart card is not needed.

Results

Phoenix is ready to be used with FPS-10 flash prommer and other service tools.

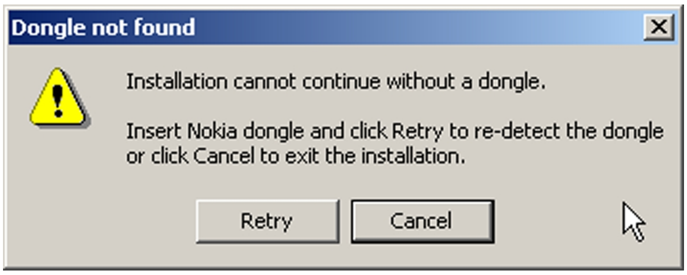
Installing *Phoenix*

Prerequisites

- Check that a dongle is attached to the parallel port of your computer.
- Download the *Phoenix* installation package (for example, *phoenix_service_sw_2004_39_x_xx.exe*) to your computer (in *C:|TEMP*, for instance).
- Close all other programs.
- Depending on your operating system, administrator rights may be required to install *Phoenix*.
- If uninstalling or rebooting is needed at any point, you will be prompted by the InstallShield program.

Context

At some point during the installation procedure, you may get the following message:



Installation cannot continue without a dongle.

Insert Nokia dongle and click Retry to re-detect the dongle or click Cancel to exit the installation.

Figure 2 Dongle not found

This may be a result of a defective or too old PKD-1 dongle.

Check the COM/parallel ports used. After correcting the problem, you can restart the installation.

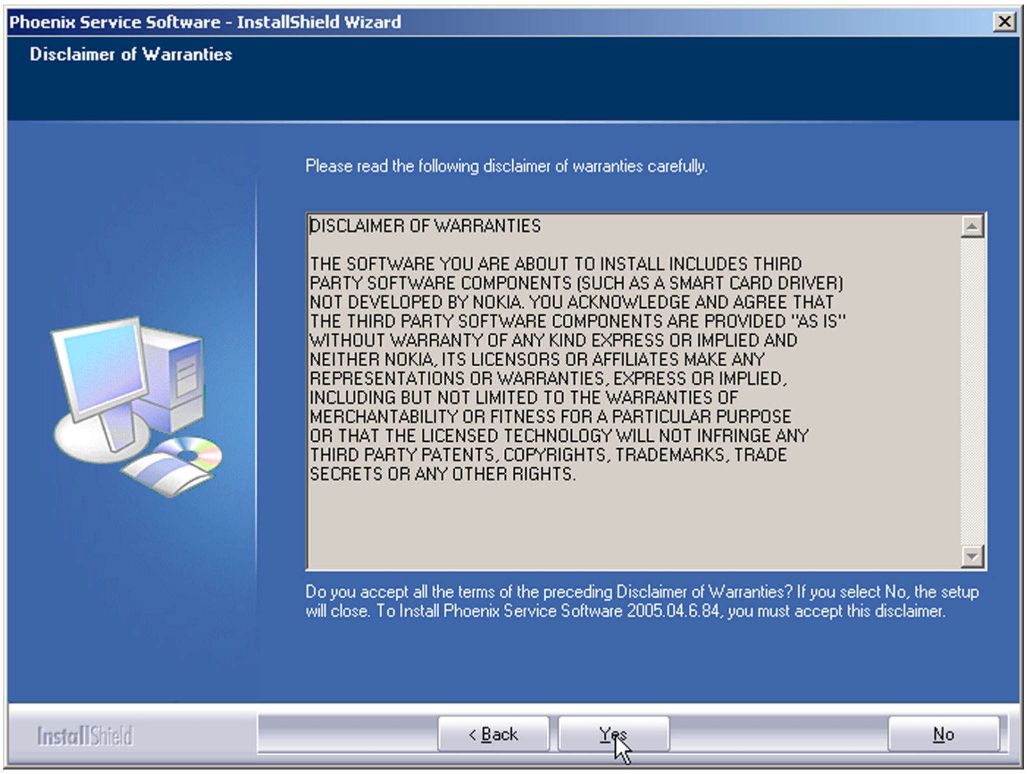
For more detailed information, please refer to *Phoenix* Help files.

> **Tip:** Each feature in *Phoenix* has its own Help function, which can be activated while running the program. Press the **F1** key or the feature’s **Help** button to activate a Help file.

Steps

1. To start the installation, run the application file (for example,*phoenix_service_sw_2004_39_x_xx.exe*).
2. In the *Welcome* dialogue, click **Next**.

3. Read the disclaimer text carefully and click **Yes**.



Phoenix Service Software - InstallShield Wizard

Disclaimer of Warranties

Please read the following disclaimer of warranties carefully.

DISCLAIMER OF WARRANTIES

THE SOFTWARE YOU ARE ABOUT TO INSTALL INCLUDES THIRD PARTY SOFTWARE COMPONENTS (SUCH AS A SMART CARD DRIVER) NOT DEVELOPED BY NOKIA. YOU ACKNOWLEDGE AND AGREE THAT THE THIRD PARTY SOFTWARE COMPONENTS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND EXPRESS OR IMPLIED AND NEITHER NOKIA, ITS LICENSORS OR AFFILIATES MAKE ANY REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR THAT THE LICENSED TECHNOLOGY WILL NOT INFRINGE ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADEMARKS, TRADE SECRETS OR ANY OTHER RIGHTS.

Do you accept all the terms of the preceding Disclaimer of Warranties? If you select No, the setup will close. To Install Phoenix Service Software 2005.04.6.84, you must accept this disclaimer.

Figure 3 Disclaimer text

4. Choose the destination folder.

   The default folder *C:|ProgramFiles|Nokia|Phoenix* is recommended.

5. To continue, click **Next.**

   To choose another location, click **Browse** (not recommended).

6. Wait for the components to be copied.

   The progress of the installation is shown in the *Setup Status* window.

7. Wait for the drivers to be installed and updated.

   The process may take several minutes to complete.

   If the operating system does not require rebooting, the PC components are registered right away.

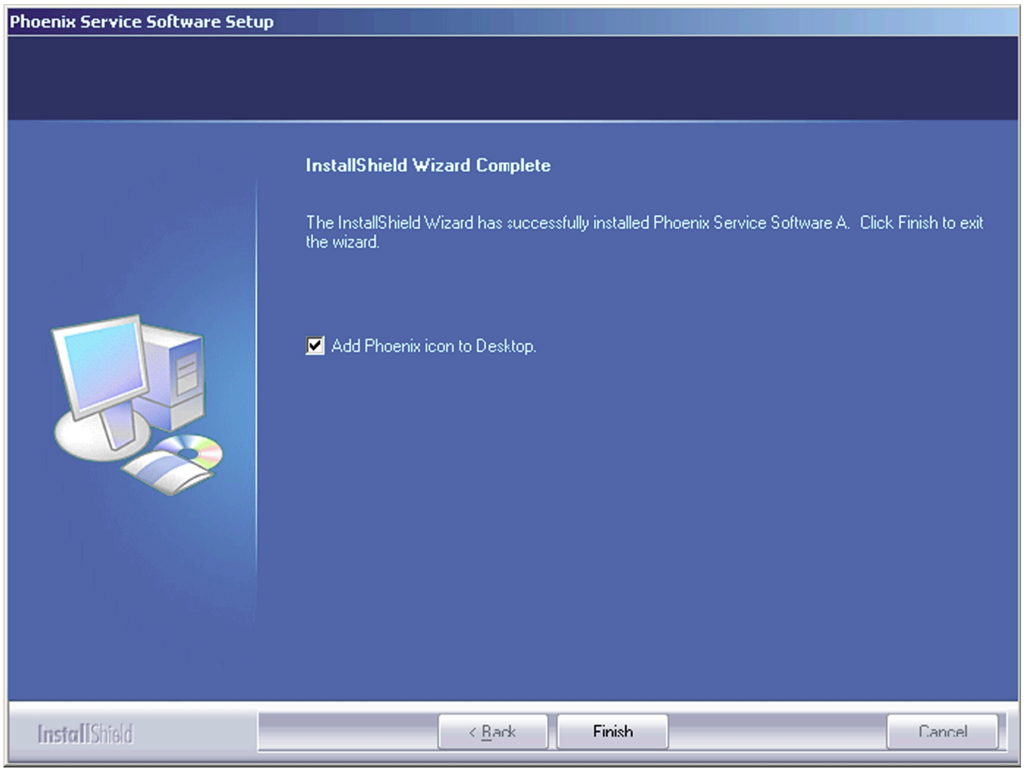
   If the operating system requires restarting your computer, the Install Shield Wizard will notifies about it.

   Select **Yes...** to reboot the PC immediately or **No...** to reboot the PC manually afterwards.

   After the reboot, all components are registered.

   Note: *Phoenix* does not work, if the components have not been registered.

8. To end the installation, click **Finish**.



Phoenix Service Software Setup

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed Phoenix Service Software A. Click Finish to exit the wizard.

☑ Add Phoenix icon to Desktop.

Figure 4 InstallShield Wizard Complete

Next actions

After the installation, *Phoenix* can be used after:

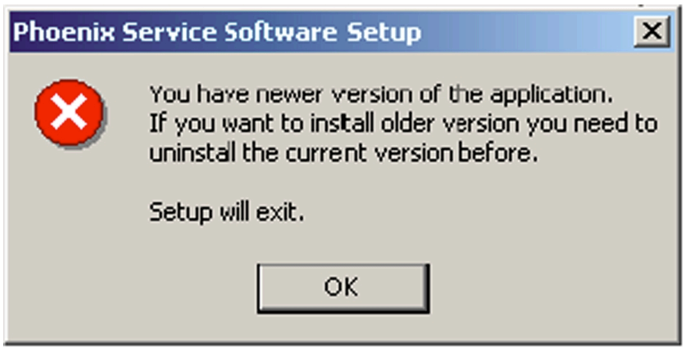
- installing phone model specific data package for *Phoenix*
- configuring users and connections

FPS-10 flash prommer can be used after updating their flash update package files.

Updating *Phoenix* installation

Context

- If you already have the *Phoenix* service software installed on your computer, you need to update the software when new versions are released.
- To update *Phoenix*, you need to follow the same steps as when installing it for the first time.
- When you are updating, for example, from version **a14_2004_16_4_47** to **a15_2004_24_7_55**, the update will take place automatically without uninstallation.
- Always use the latest available versions of both *Phoenix* and the phone-specific data package. Instructions can be found in the phone model specific Technical Bulletins and phone data package *readme.txt* files (shown during installation).
- If you try to update *Phoenix* with the same version you already have (for example, **a15_2004_24_7_55** to **a15_2004_24_7_55**), you are asked if you want to uninstall the existing version. In this case you can choose between a total uninstallation or a repair installation in a similar way when choosing to uninstall the application from the *Windows* Control Panel.
- If you try to install an older version (for example, downgrade from **a15_2004_24_7_55** to **a14_2004_16_4_47**), installation will be interrupted.



Phoenix Service Software Setup

You have newer version of the application.
If you want to install older version you need to uninstall the current version before.

Setup will exit.

Figure 5 Installation interrupted

- Always follow the instructions on the screen.

Steps

1. Download the installation package to your computer hard disk.
2. Close all other programs.
3. Run the application file (for example, *phoenix_service_sw_2004_39_x_xx.exe*).

Results

A new *Phoenix* version is installed and driver versions are checked and updated.

Uninstalling *Phoenix*

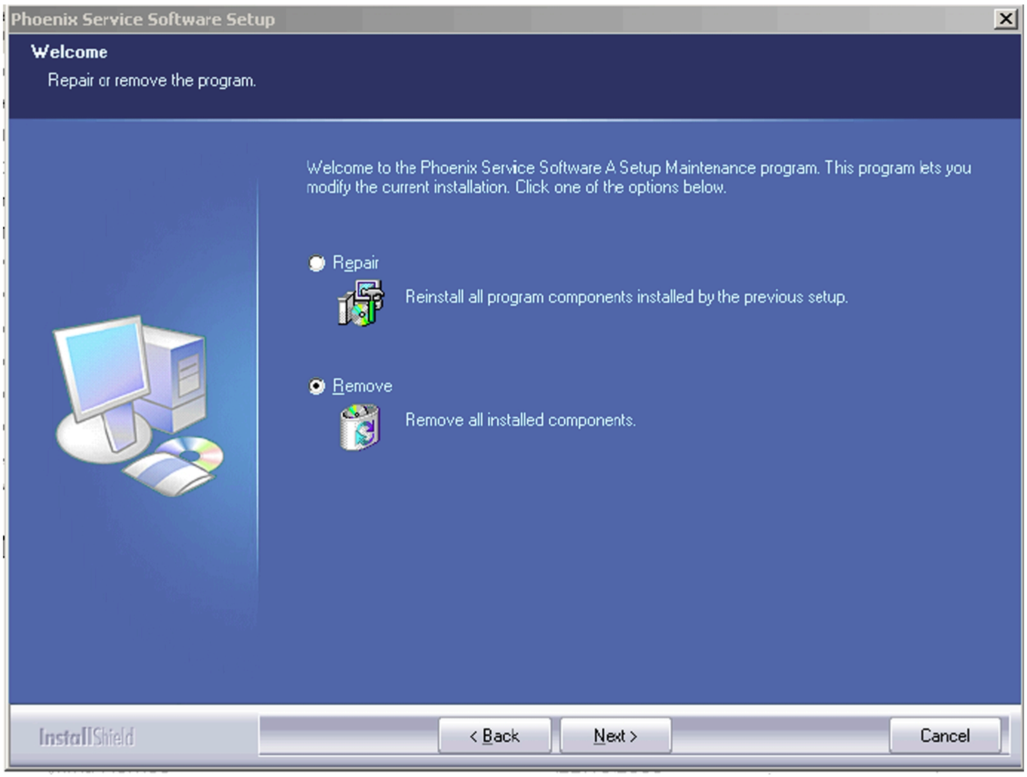
Context

You can uninstall *Phoenix* service software manually from the *Windows* Control Panel.

Steps

1. Open the **Windows Control Panel**, and choose **Add/Remove Programs**.

2. To uninstall *Phoenix*, choose **Phoenix Service Software→Change/Remove→Remove** .



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

○ Repair

Reinstall all program components installed by the previous setup.

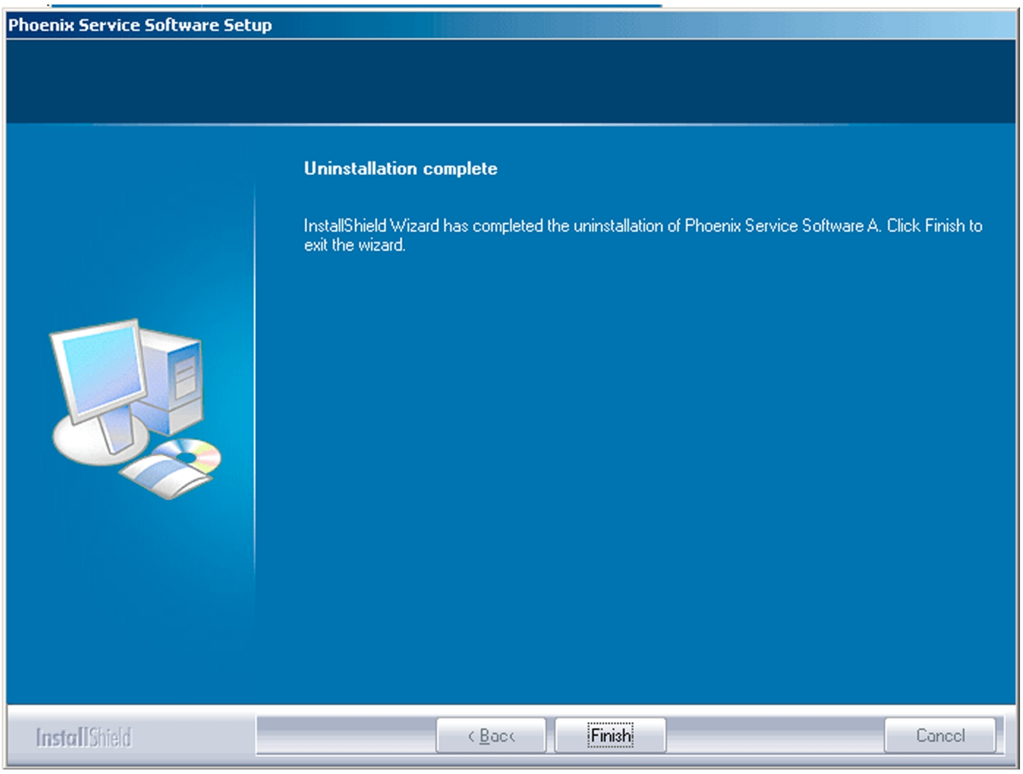
● Remove

Remove all installed components.

Figure 6 Remove program

The progress of the uninstallation is shown.

3. If the operating system does not require rebooting, click **Finish** to complete.



Phoenix Service Software Setup

Uninstallation complete

InstallShield Wizard has completed the uninstallation of Phoenix Service Software A. Click Finish to exit the wizard.

Figure 7 Finish uninstallation

If the operating system requires rebooting, InstallShield Wizard will notify you. Select **Yes...** to reboot the PC immediately and **No...** to reboot the PC manually afterwards.

Repairing *Phoenix* installation

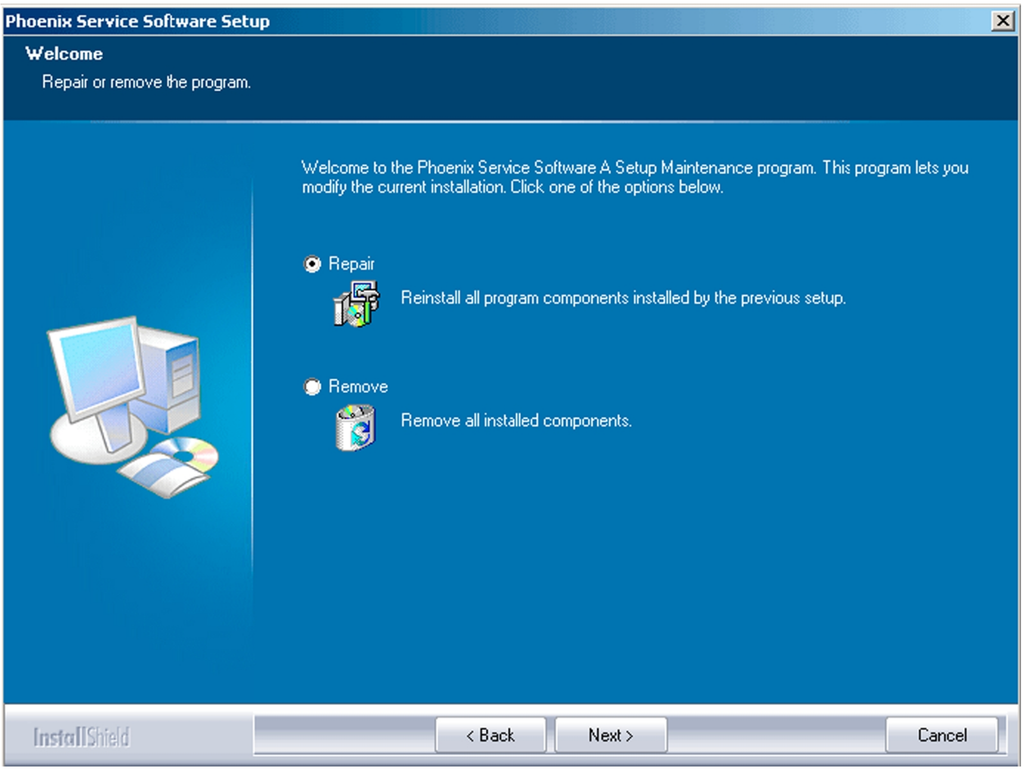
Context

If you experience any problems with the service software or suspect that files have been lost, use the repair function before completely reinstalling *Phoenix*.

> **Note:** The original installation package (for example, *phoenix_service_sw_a15_2004_24_7_55.exe*) must be found on your PC when you run the repair setup.

Steps

1. Open **Windows Control Panel→Add/Remove Programs** .
2. Choose **Phoenix Service Software→Change/Remove** .
3. In the following view, select **Repair**.



Phoenix Service Software Setup

Welcome

Repair or remove the program.

Welcome to the Phoenix Service Software A Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.

● Repair

Reinstall all program components installed by the previous setup.

○ Remove

Remove all installed components.

Figure 8 Repair program

Phoenix reinstalls components and registers them.

The procedure is the same as when updating *Phoenix*.

4. To complete the repair, click **Finish**.

Installing phone data package

Prerequisites

- A phone-specific data package contains all data required for the *Phoenix* service software and service tools to be used with a certain phone model.
- Check that a dongle is attached to the parallel port of your computer.

- Install *Phoenix* service software.
- Download the installation package (for example, *XX-XX_dp_EA_v_1_0.exe*) to your computer (for example, in C:\TEMP).
- Close all other programs.

(XX-XX = type designator of the product)

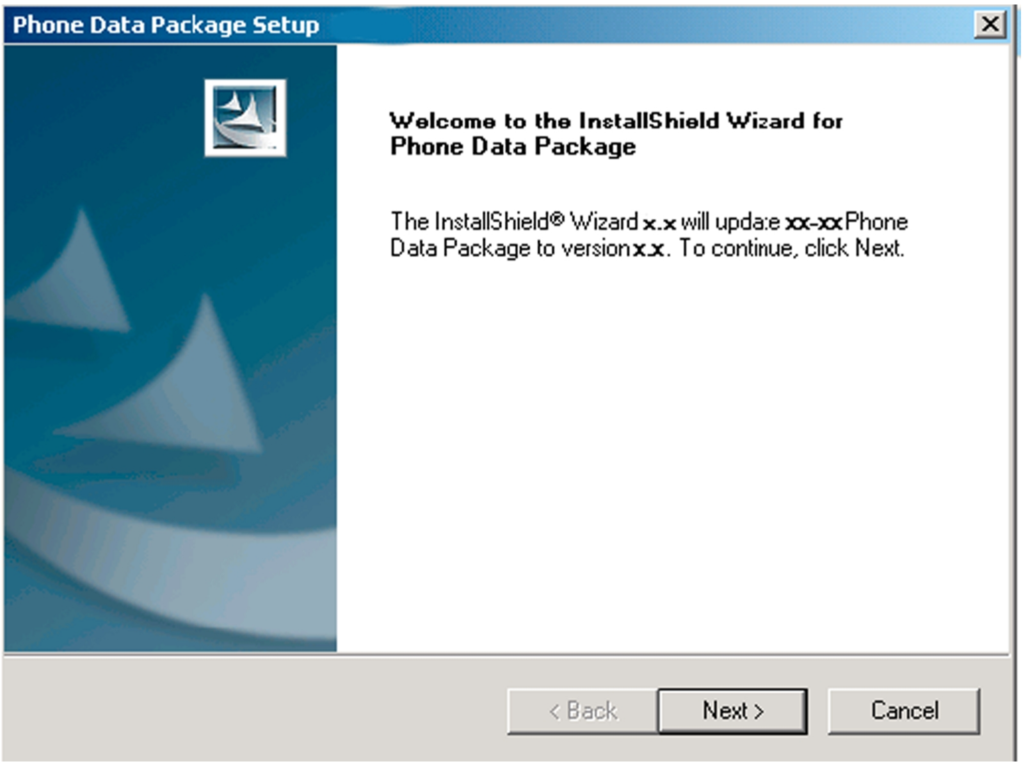
If you already have *Phoenix* installed on your computer, you will need to update it when a new version is released.

> **Note:** Often *Phoenix* and the phone-specific data package come in pairs, meaning that a certain version of *Phoenix* can only be used with a certain version of a data package. Always use the latest available versions of both. Instructions can be found in phone-specific Technical Bulletins and *readme.txt* files of data packages.

Steps

1. To start the installation, run the application file (for example, *XX-XX_dp_EA_ v_1_0.exe*),

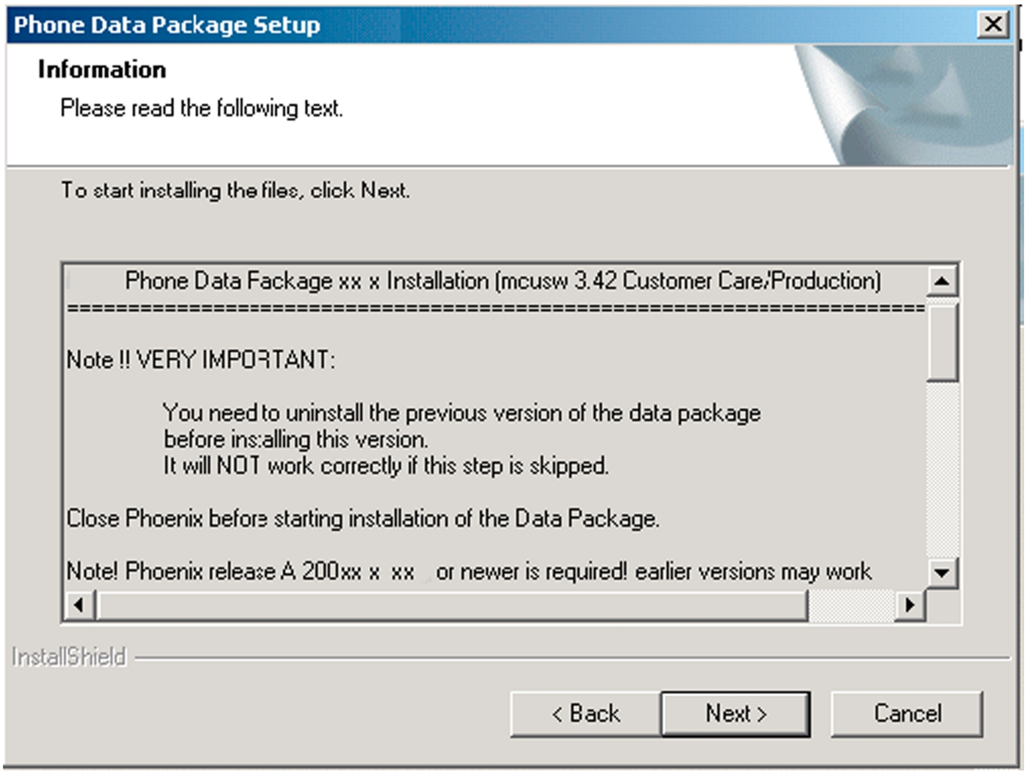
   Wait for the installation files to be extracted.
2. Click **Next**.



Welcome to the InstallShield Wizard for Phone Data Package

The InstallShield® Wizard **x.x** will upda:e **xx-xx** Phone Data Package to version **x.x**. To continue, click Next.

3. In the following view you can see the contents of the data package. Read the text carefully. There is information about the *Phoenix* version required with this data package.


Phone Data Package Setup
Information
Please read the following text.
InstallShield
< Back
Next >
Cancel

To start installing the files, click Next.

Phone Data Package xx x Installation (mcusw 3.42 Customer Care/Production)

Note !! VERY IMPORTANT:

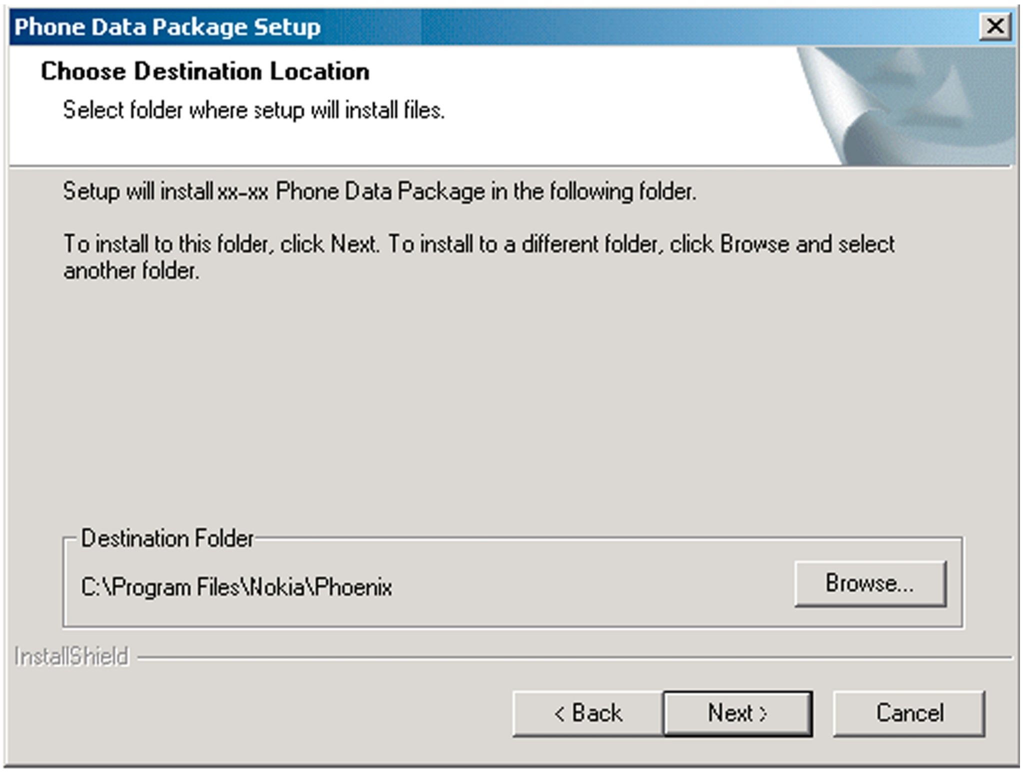
You need to uninstall the previous version of the data package
before installing this version.
It will NOT work correctly if this step is skipped.

Close Phoenix before starting installation of the Data Package.

Note! Phoenix release A 200xx x xx or newer is required! earlier versions may work

Figure 9 Data package setup information

4. To continue, click **Next**.
5. Choose the destination folder, and click **Next** to continue.


Phone Data Package Setup
Choose Destination Location
Select folder where setup will install files.
Browse...
InstallShield
< Back
Next >
Cancel

Setup will install xx-xx Phone Data Package in the following folder.

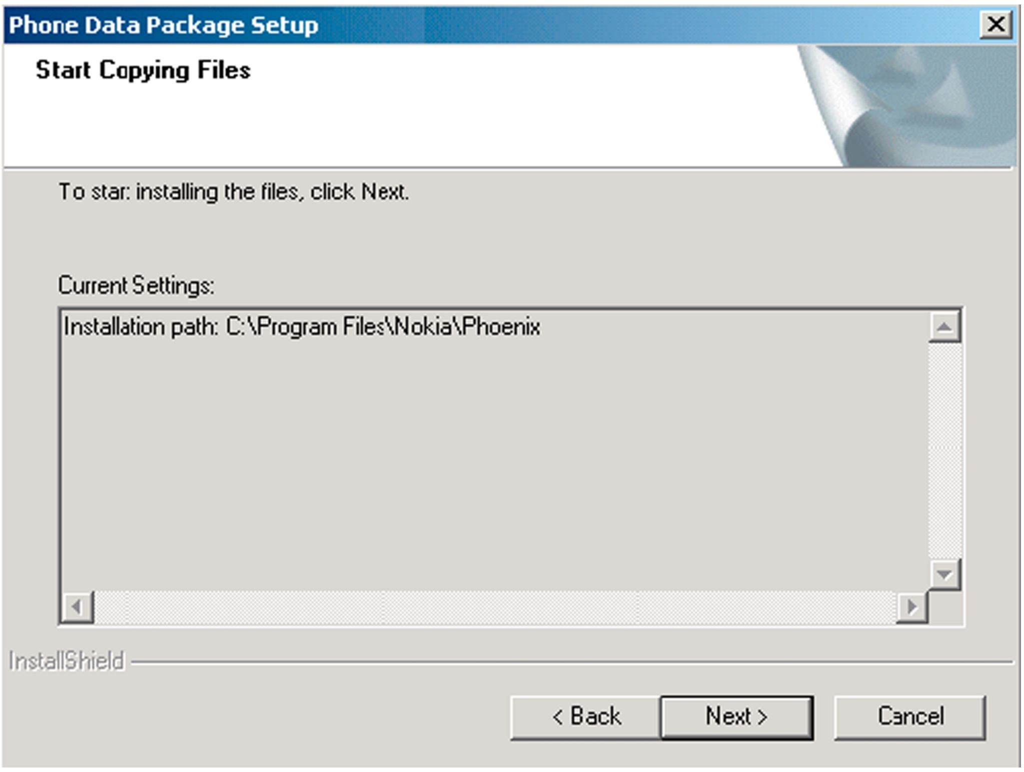
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder
C:\Program Files\Nokia\Phoenix

Figure 10 Data package destination folder

The InstallShield Wizard checks where *Phoenix* is installed, and the directory is shown.

6. To start copying the files, click **Next**.



Phone Data Package Setup
Start Copying Files
InstallShield
< Back
Next >
Cancel

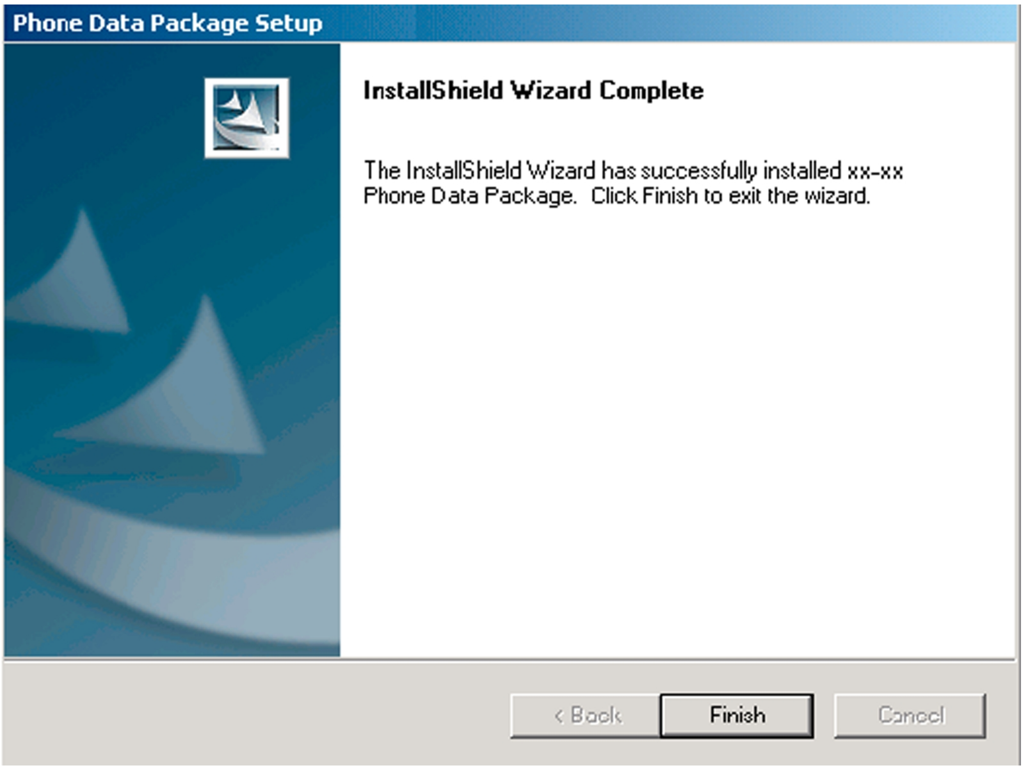
To star: installing the files, click Next.

Current Settings:

Installation path: C:\Program Files\Nokia\Phoenix

Phone model specific files are installed. Please wait.

7. To complete the installation, click **Finish**.



Phone Data Package Setup
InstallShield Wizard Complete
< Back
Finish
Cancel

The InstallShield Wizard has successfully installed xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 11 InstallShield Wizard Complete

Next actions

Phoenix can be used for flashing phones and printing type labels after:

- Configuring users
- Managing connections

FPS-10 can be used after updating its flash update package files.

Uninstalling phone data package

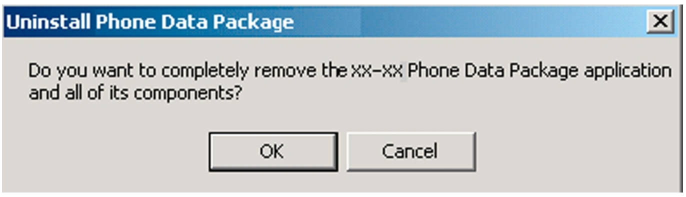
Context

There is no need to uninstall an older version of a data package, unless instructions to do so are given in the *readme.txt* file of the data package and bulletins related to the release.

Please read all related documents carefully.

Steps

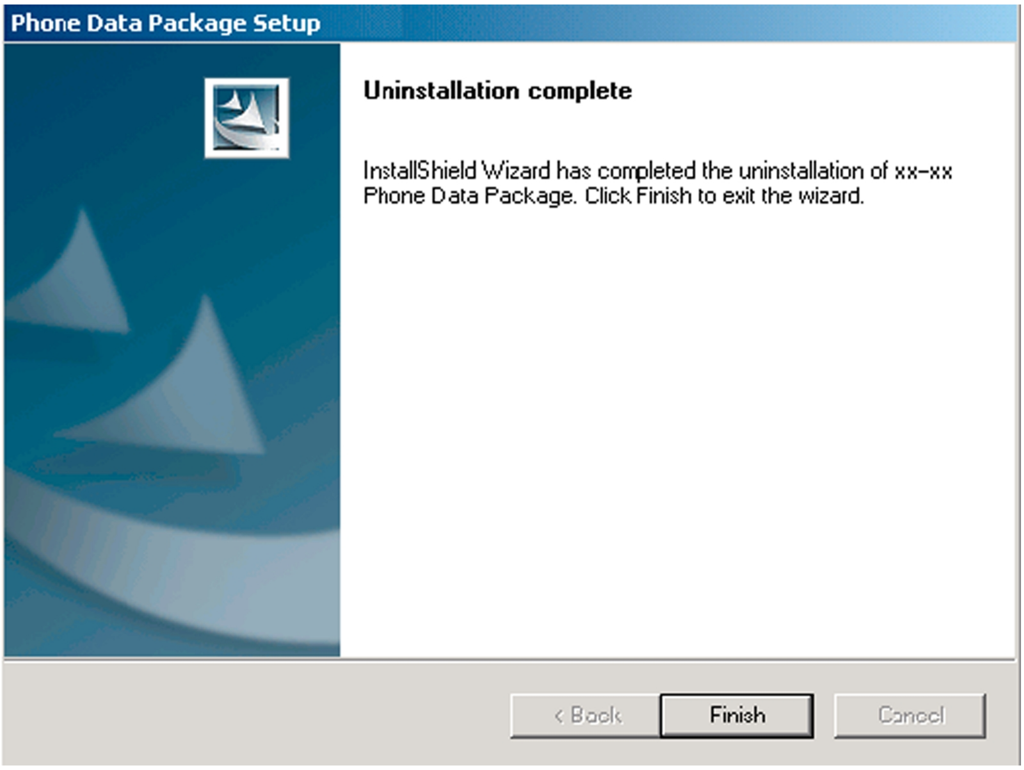
1. Locate the data package installation file (e.g. *XX-XX_dp_EA_v_1_0.exe*) from your computer.
2. To start the uninstallation procedure, double-click the data package installation file.
3. To uninstall the data package, click **OK** or to interrupt the uninstallation, click **Cancel**.



Do you want to completely remove the XX-XX Phone Data Package application and all of its components?

Figure 12 Uninstalling phone data package

4. When the data package is uninstalled, click **Finish**.



Phone Data Package Setup

Uninstallation complete

InstallShield Wizard has completed the uninstallation of xx-xx Phone Data Package. Click Finish to exit the wizard.

Figure 13 Finishing data package uninstallation

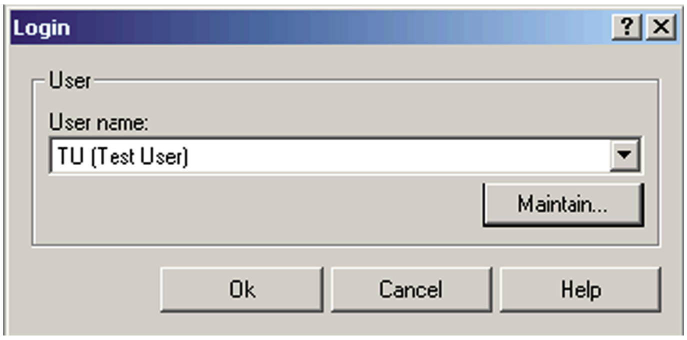
Alternative steps

- You can also uninstall the data package manually from **Control Panel→Add/Remove Programs→xx-xx* Phone Data Package** . (*= type designator of the phone).

Configuring users in *Phoenix*

Steps

1. Start *Phoenix* service software, and log in.



Login

User

User name: TU (Test User)

Figure 14 Phoenix login

If the user ID is already configured, select s/he from the *User name* drop-down list, and click **OK**.

2. To add a new user, or to edit existing ones, click **Maintain**.
3. To add a new user, click **New**.

4. Type in the name and initials of the user, and click **OK**.

   The user is added to the user name list.
5. Select the desired user from the *User name* drop-down list, and click **OK**.

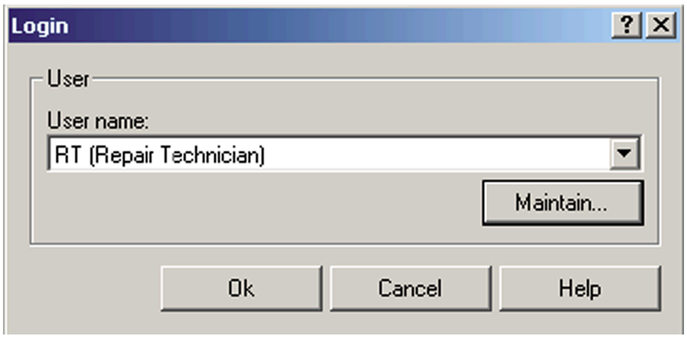

Login
User
User name:
RT (Repair Technician)
Maintain...
Ok
Cancel
Help

Figure 15 New user configured

Managing connections in *Phoenix*

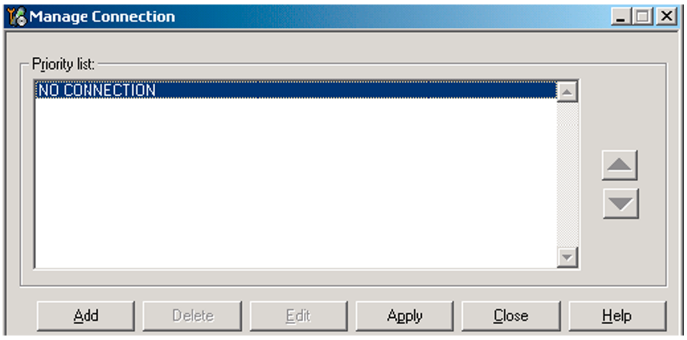
Context

With the **Manage Connections** feature you can edit and delete existing connections or create new ones.

> **Note:** After choosing the desired connection, and connecting the phone to a PC for the first time, allow the PC to install the USB device drivers first. Please note that this may take some time to complete.
>
> If there are problems after the driver installation, check that the USB connection is active from the **Windows Control Panel**. If the problem persists, contact the local PC support.

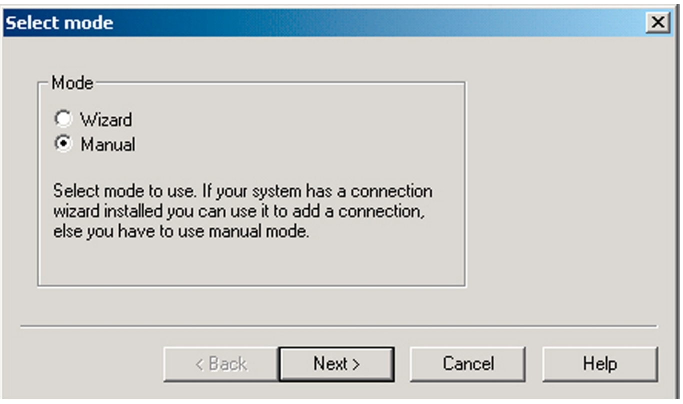
Steps

1. Start *Phoenix*, and log in.
2. Choose **File→Manage Connections...** .
3. To add a new connection, click **Add**.


Manage Connection
Priority list:
NO CONNECTION
Add
Delete
Edit
Apply
Close
Help

4. Select **Manual** mode, and click **Next** to continue.

   If you want to create the connection using the Connection Wizard, connect the tools and a phone to your PC. The wizard will automatically try to configure the correct connection.



Mode

○ Wizard

● Manual

Select mode to use. If your system has a connection wizard installed you can use it to add a connection, else you have to use manual mode.

Figure 16 Select mode: Manual

i For an FPS-10 flash prommer with a **USB Connection**, choose the following connection settings:
- Media: **FPS-10 USB**
- DEVICE_INDEX: **0**
- SERIAL_NUM: See Serial No from the label attached to the bottom of FPS-10
- ACTIVE_MEDIA: **USB**

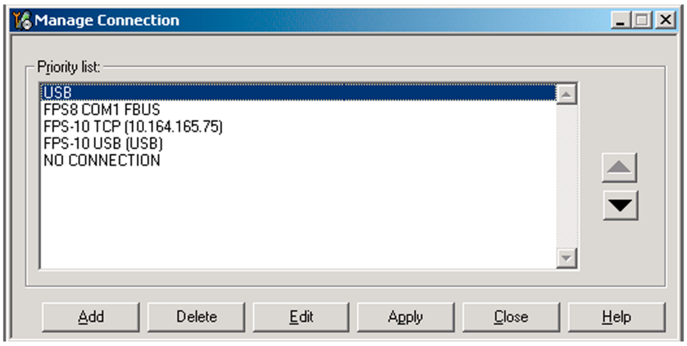
ii For an FPS-10 flash prommer with a **LAN connection**, choose the following connection settings:
- Media: **FPS-10 TCP/IP**
- NET_SERV_NAME: Click **Scan...**. Choose your own FPS-10 device based on the correct MAC address. See Serial No from the label attached to the bottom of your FPS-10.
- PORT_NUM: Use the default value, and click **Next**.
- PROTOCOL_FAMILY: Use the default value, and click **Next**.
- SOCKET TYPE: Use the default value, and click **Next**.
- TX_BUFFER_SIZE: Use the default value, and click **Next**.
- RX_BUFFER_SIZE: Use the default value, and click **Next**.

iii For a plain **USB connection**, choose the following connection settings:

Note: First connect the DKU-2 or CA-53 USB cable between the PC USB port and phone.

- Media: USB

5. To complete the configuration, click **Finish**.
6. Click the connection you want to activate. Use the up/down arrows located on the right hand side to move it on top of the list, then click **Apply**.



Priority list:

USB
FPS8 COM1 FBUS
FPS-10 TCP (10.164.165.75)
FPS-10 USB (USB)
NO CONNECTION

Figure 17 Connections list

The connection is activated, and it can be used after closing the *Manage Connection* window.

The connection information is shown at the right hand bottom corner of the screen.

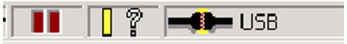
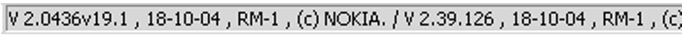


Figure 18 Connection information

7. To use the connection, connect the phone to your PC with correct service tools. Make sure the phone is switched on, and then choose **File→Scan Product** .

Results

The product support module information appears in the status bar:



V 2.0436v19.1 , 18-10-04 , RM-1 , (c) NOKIA. / V 2.39.126 , 18-10-04 , RM-1 , (c)

Figure 19 Product support module information (example from RM-1)

Installing flash support files for FPS-10

Prerequisites

- Install *Phoenix* service software.
- Install phone model specific data package for *Phoenix*.
- If you want to update the flash support files, they are delivered in the same installation package with *Phoenix* or newer *Phoenix* packages beginning from December 2004.

  In case you want to update the MCU files, install the latest data package (see Technical Bulletins for information on the latest one).

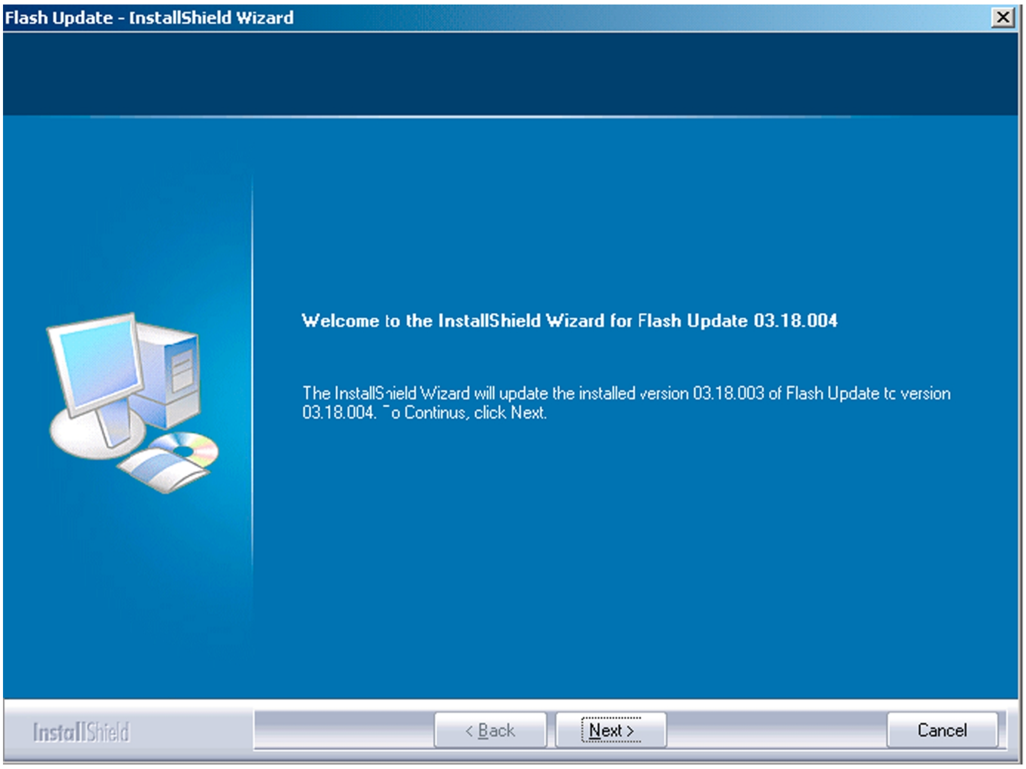
  Normally, it is enough to install *Phoenix* and the phone-specific data package because the installation always includes the latest flash update package files for FPS-10.
- A separate installation package for flash support files is available. The files can be updated according to these instructions, if updates appear between *Phoenix* data package releases.

Context

If you are not using a separate installation package, you can skip this section and continue with "Updating FPS-10 flash prommer software" (page 3–22) after installing a new phone data package.

Steps

1. To begin the installation, double-click the flash update file (for example, *flash_update_03_183_0014.exe*).



Welcome to the InstallShield Wizard for Flash Update 03.18.004

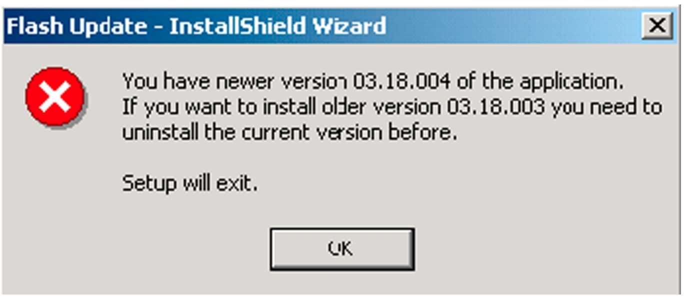
The InstallShield Wizard will update the installed version 03.18.003 of Flash Update to version 03.18.004. To Continue, click Next.

Figure 20 Flash update welcome dialog

If the same version of the flash update package already exists, and you want to reinstall it, the previous package is first uninstalled.

Restart installation again after the uninstallation.

2. If you try to downgrade the existing version to older ones, the setup will be aborted. If there is a need to downgrade the version, uninstall newer files manually from the **Windows Control Panel**, and then rerun the installation.



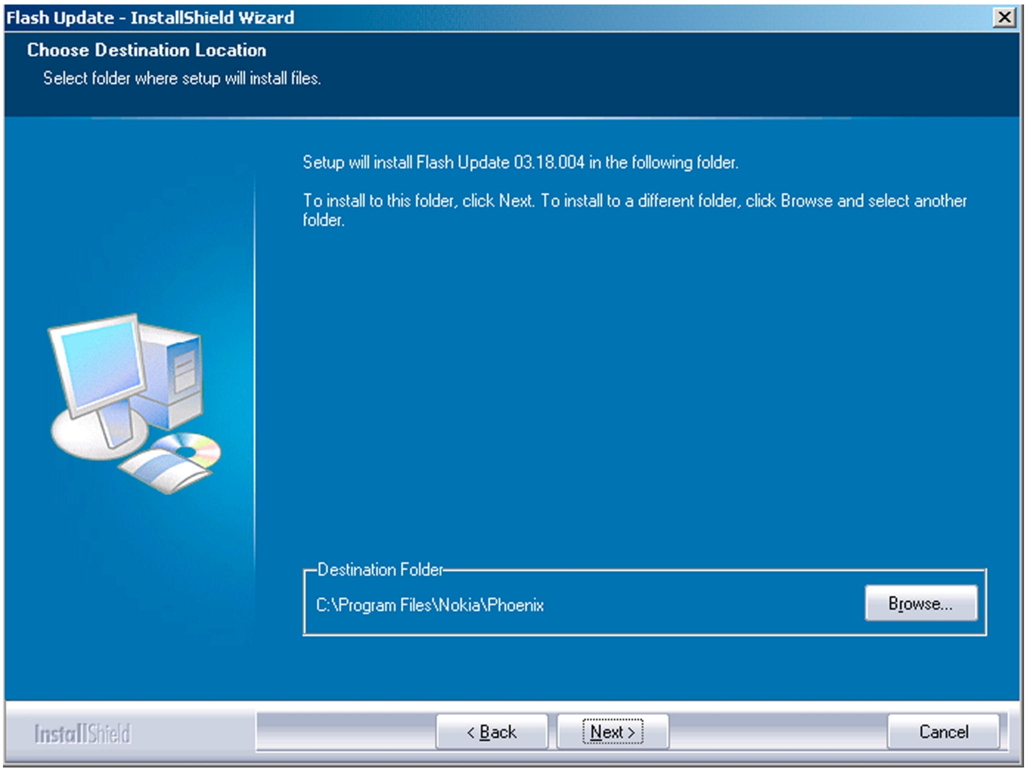
You have newer version 03.18.004 of the application.
If you want to install older version 03.18.003 you need to uninstall the current version before.

Setup will exit.

Figure 21 Flash installation interrupted

If an older version exists on your PC and it needs to be updated, click **Next** to continue installation.

3. It is recommended to install the files to the default destination folder *C:|Program Files|Nokia|Phoenix*. To continue, click **Next**.



Flash Update - InstallShield Wizard

Choose Destination Location

Select folder where setup will install files.

Setup will install Flash Update 03.18.004 in the following folder.

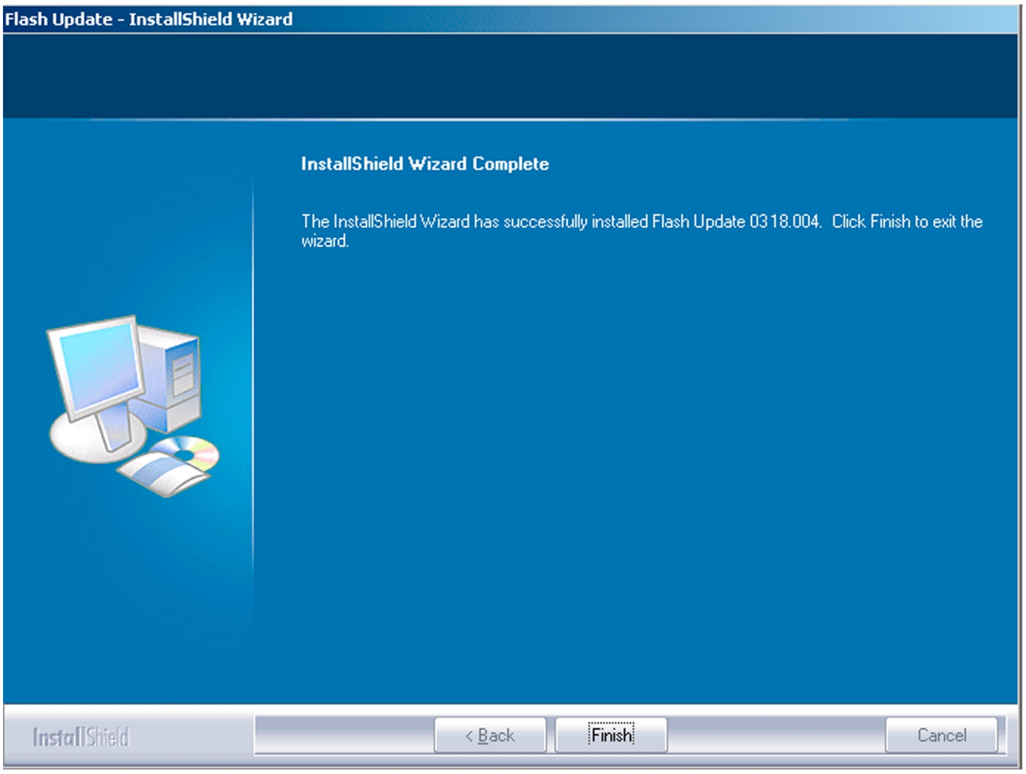
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.

Destination Folder: C:\Program Files\Nokia\Phoenix

Figure 22 Flash destination folder

When installing the flash update files for the first time, you may choose another location by selecting **Browse** (not recommended).

4. To complete the installation procedure, click **Finish** .


Flash Update - InstallShield Wizard
InstallShield Wizard Complete
InstallShield
< Back
Finish
Cancel

The InstallShield Wizard has successfully installed Flash Update 0318.004. Click Finish to exit the wizard.

Figure 23 Finish flash update

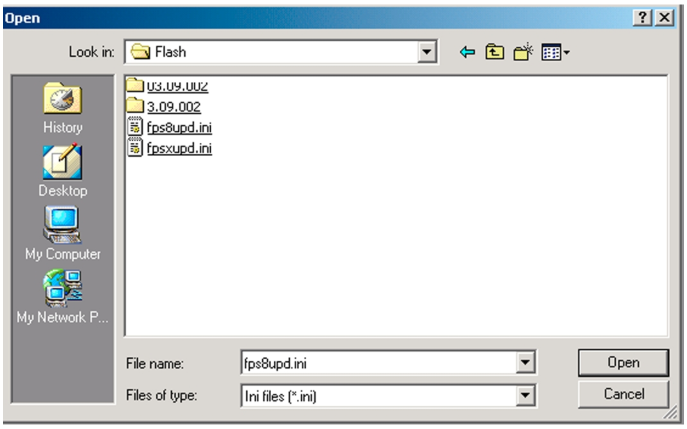
Next actions

FPS-10 flash prommer must be updated using *Phoenix*.

Updating FPS-10 flash prommer software

Steps

1. Start *Phoenix* service software, and log in.
2. Choose the correct connection for your flash prommer: **File→Manage Connections...**
3. Choose **Flashing→Prommer maintenance** .
4. To update the **FPS-10** software, click **Update**, and select the appropriate file or *fpsxupd.ini* (for FPS-10) from *C:|Program Files|Nokia|Phoenix|Flash*.


Open
? X
Look in:
History
Desktop
My Computer
My Network P...
Open
Cancel

Look in: Flash

3.09.002
fps8upd.ini
fpsxupd.ini

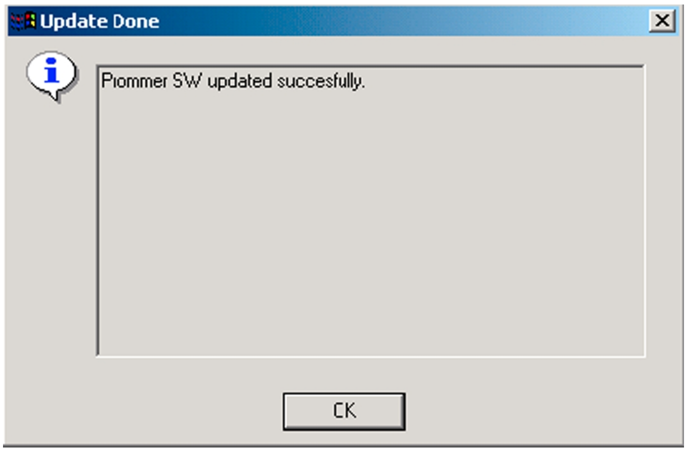
File name: fps8upd.ini

Files of type: Ini files (*.ini)

Figure 24 Flash directory window

Tip: All files can be loaded separately to the prommer used. To do this, click the right mouse button in the *Flash Box Files* pane and select the file type(s) to be loaded.

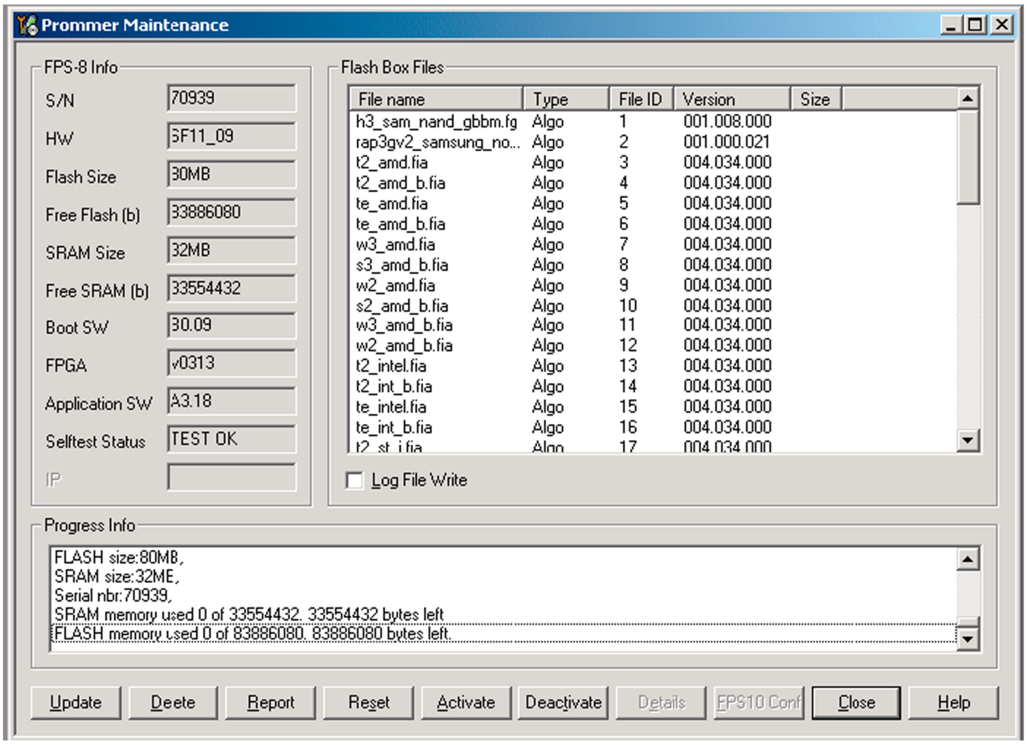
5. Click **OK**.


Update Done
OK

Prommer SW updated succesfully.

Figure 25 Prommer software update finished

6. To close the *Prommer Maintenance* window, click **Close**.


Prommer Maintenance
FPS-8 Info
Flash Box Files
Progress Info
Update
Deete
Report
Reset
Activate
Deactivate
Details
FPS10 Conf
Close
Help

S/N 70939
HW 5F11_09
Flash Size 80MB
Free Flash (b) 83886080
SRAM Size 32MB
Free SRAM (b) 33554432
Boot SW 30.09
FPGA v0313
Application SW A3.18
Selftest Status TEST OK
IP

File name	Type	File ID	Version	Size
h3_sam_nand_gbbm.fg	Algo	1	001.008.000	
rap3gv2_samsung_no...	Algo	2	001.000.021	
t2_amd.fia	Algo	3	004.034.000	
t2_amd_b.fia	Algo	4	004.034.000	
te_amd.fia	Algo	5	004.034.000	
te_amd_b.fia	Algo	6	004.034.000	
w3_amd.fia	Algo	7	004.034.000	
s3_amd_b.fia	Algo	8	004.034.000	
w2_amd.fia	Algo	9	004.034.000	
s2_amd_b.fia	Algo	10	004.034.000	
w3_amd_b.fia	Algo	11	004.034.000	
w2_amd_b.fia	Algo	12	004.034.000	
t2_intel.fia	Algo	13	004.034.000	
t2_int_b.fia	Algo	14	004.034.000	
te_intel.fia	Algo	15	004.034.000	
te_int_b.fia	Algo	16	004.034.000	
t2_st_i.fia	Algo	17	004.034.000	

☐ Log File Write

```
FLASH size:80MB,
SRAM size:32ME,
Serial nbr:70939,
SRAM memory used 0 of 33554432. 33554432 bytes left
FLASH memory used 0 of 83886080. 83886080 bytes left.
```

Figure 26 *Prommer Maintenance* window

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4 — Service Tools and Service Concepts

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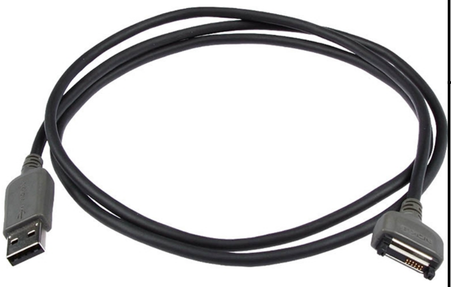
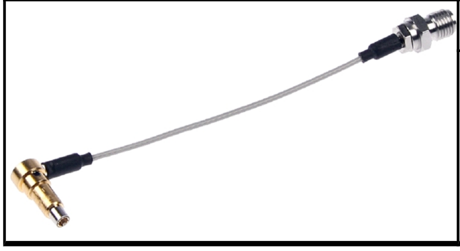
Service tools

The table below gives a short overview of service tools that can be used for testing, error analysis and repair of product RM-208, refer to various concepts.

	AC-33	Power supply	
	Universal power supply for FPS-10; included in the FPS-10 sales package.		
	CA-31D	USB cable	
	The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.		
	CA-53	USB connectivity cable	
	USB to system connector cable.		
	CA-56RS	RF cable	
	Small RF cable that is used for RF tuning with MJ-120 module jig for BT and WLAN measurements.		

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

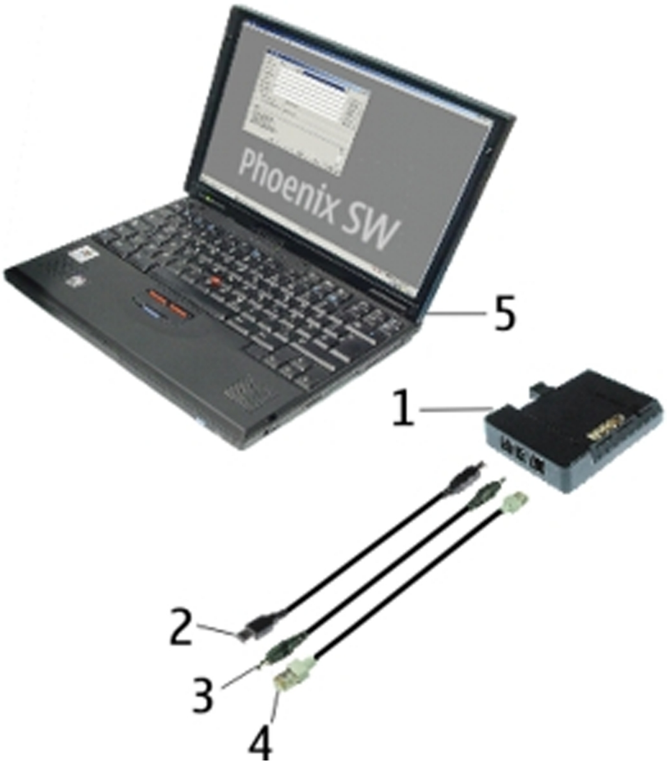
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

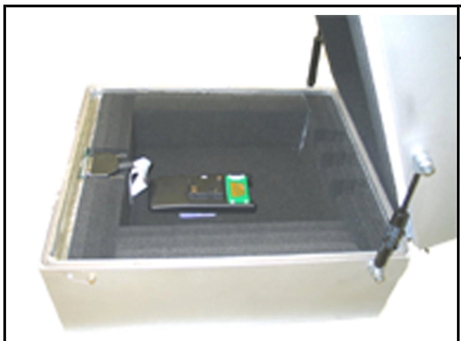
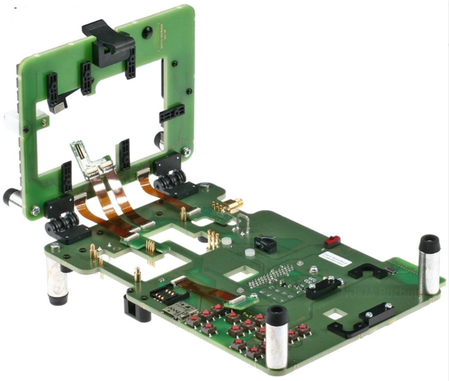
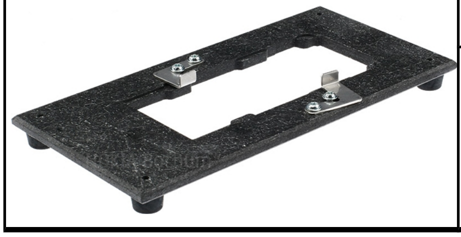
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.

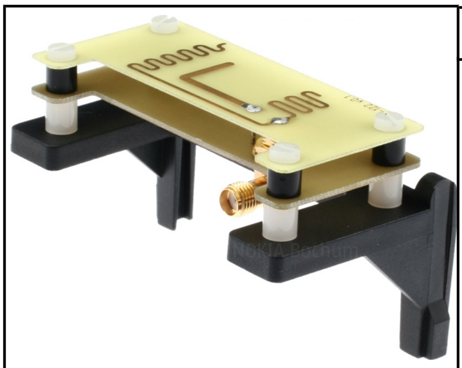


Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

	FLS-5	Flash device	
	FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.		
	FPS-10	Flash prommer	
	FPS-10 interfaces with: • PC • Control unit • Flash adapter • Smart card FPS-10 flash prommer features: • Flash functionality for BB5 and DCT-4 terminals • Smart Card reader for SX-2 or SX-4 • USB traffic forwarding • USB to FBUS/Flashbus conversion • LAN to FBUS/Flashbus and USB conversion • Vusb output switchable by PC command FPS-10 sales package includes: • FPS-10 prommer • Power Supply with 5 country specific cords • USB cable		
	FS-45	Product specific adapter	
	RM-208 specific adapter.		

	JXS-1	RF shield box	
	Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal. The shield box is not an active device, it contains only passive filtering components for RF attenuation.		
	MJ-120	Module jig	
	RM-208 specific module jig.		
	RJ-142	Soldering jig	
	RM-208 specific soldering jig.		



SA-122	GSM&WCDMA coupler	

RM-208 specific GSM&WCDMA coupler.

- Flash adapter antenna coupler SA-122 attenuation table for NOKIA E65, measured with Universal Radio Communication Tester CMU-200.

Note: Attach the phone carefully when the RF coupler is fixed to SS-62.

Note: Attenuation tolerance is +/- 1.0 dB

Table 7 Attenuation values

System	Channel	Tx-att. (dB)	Rx-att.(dB)
GSM 850	128	5.0	4
	190	4.6	5
	251	4.1	5
EGSM 900	975	4.8	5
	38	3.9	5
	124	4.0	4
GSM 1800	512	6.4	6
	698	5.8	7
	885	5.7	8
GSM 1900	512	7.7	8
	661	7.4	8
	810	7.7	8
	Tx / Rx		
WCDMA	9612 / 10562	8.3	9
	9750 / 10700	8.5	9
	9888 / 10838	8.7	10

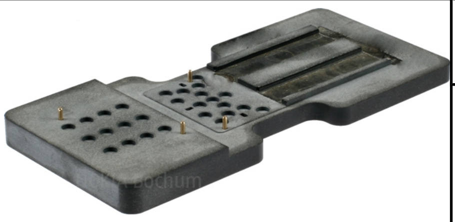
NOKIA
RF-I/O
CLASS 1
STATUS
BER TEST
FBUS
POWER

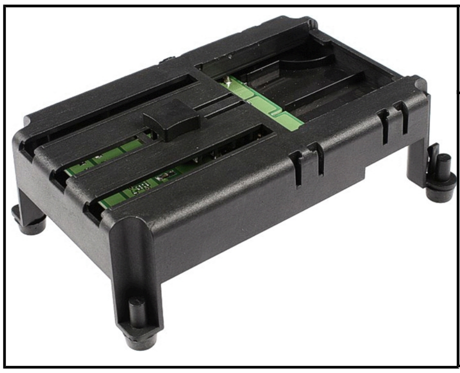
SB-6	Bluetooth test and interface box (sales package)	

The SB-6 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .

Sales package includes:

- SB-6 test box
- Installation and warranty information

<table>
<tr><td rowspan="2"> </td><td>SB-7</td><td>WLAN test box</td><td></td></tr>
<tr><td colspan="3">WLAN test requires defined position for the device.</td></tr>
<tr><td rowspan="2"> </td><td>SRT-6</td><td>Opening tool</td><td></td></tr>
<tr><td colspan="3">SRT-6 is used to open phone covers and B-to-B connectors.</td></tr>
<tr><td rowspan="2"></td><td>SS-110</td><td>Domesheet alignment jig</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2"> </td><td>SS-46</td><td>Interface adapter</td><td></td></tr>
<tr><td colspan="3">SS-46 acts as an interface adapter between the flash adapter and FPS-10.</td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>SS-62</td><td>Generic flash adapter base for BB5</td><td></td></tr>
<tr><td colspan="3">• generic base for flash adapters and couplers
• SS-62 equipped with a clip interlock system
• provides standardised interface towards Control Unit
• provides RF connection using galvanic connector or coupler
• multiplexing between USB and FBUS media, controlled by VUSB</td></tr>
</table>

Service concepts

POS (Point of Sale) flash concept

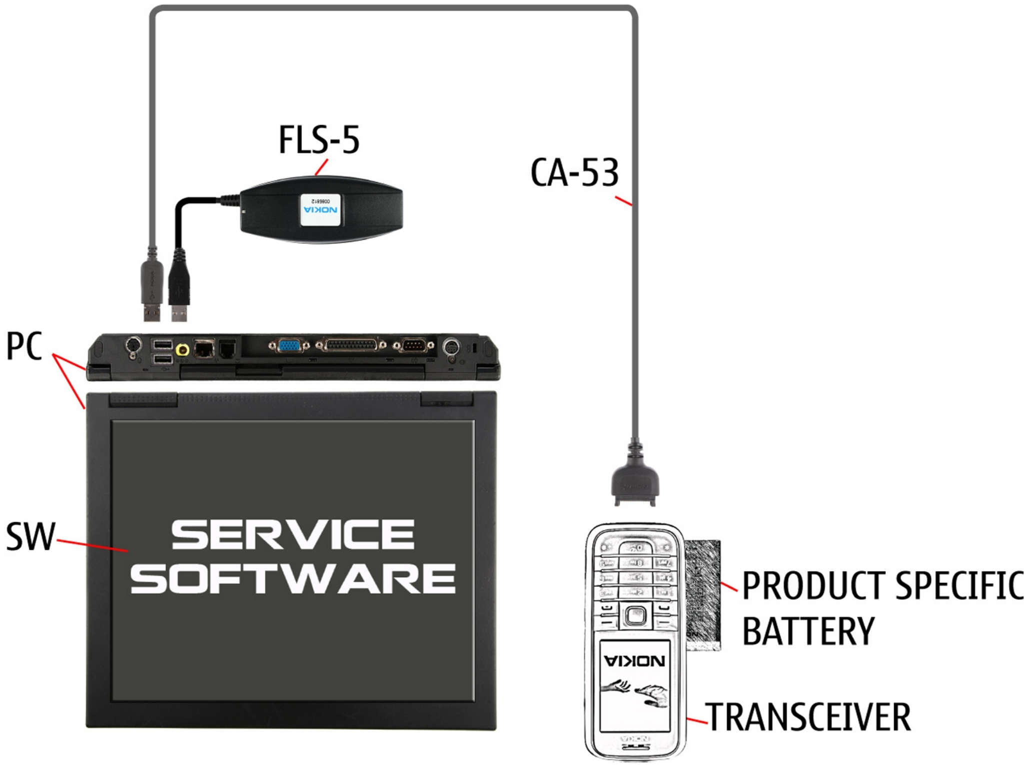

FLS-5
CA-53
PC
SW
SERVICE SOFTWARE
PRODUCT SPECIFIC BATTERY
TRANSCEIVER

Figure 27 POS flash concept

Type	Description
Product specific tools	
	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software
Cables	
CA-53	USB connectivity cable

Module jig service concept

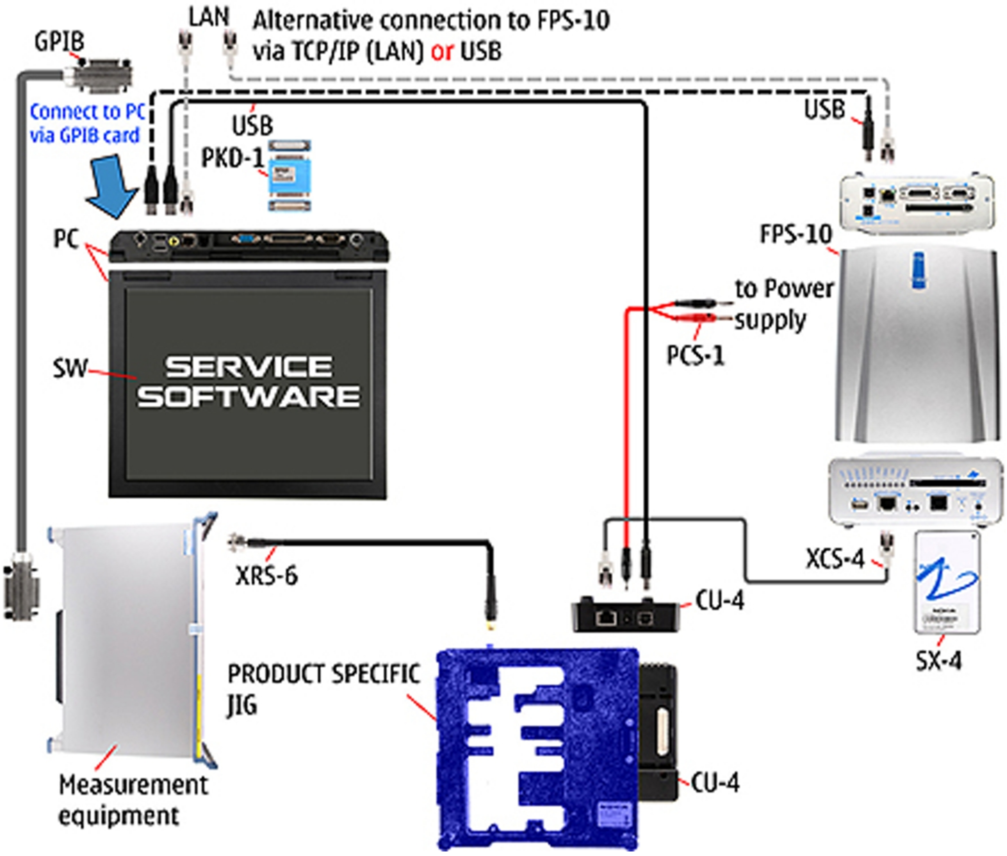

GPIB
LAN
Alternative connection to FPS-10 via TCP/IP (LAN) or USB
Connect to PC via GPIB card
USB
PKD-1
USB
FPS-10
PC
to Power supply
PCS-1
SW
SERVICE SOFTWARE
XRS-6
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC JIG
CU-4
Measurement equipment

Figure 28 Module jig service concept

Type	Description
Phone specific tools	
MJ-120	Module jig
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SX-4	Smart card
	PC with Phoenix service software
	Measurement equipment
Cables	
PCS-1	DC power cable
XCS-4	Modular cable
XRS-6	RF cable
	USB cable

Type	Description
	GPIB control cable

Service concept for RF testing and RF/BB tuning

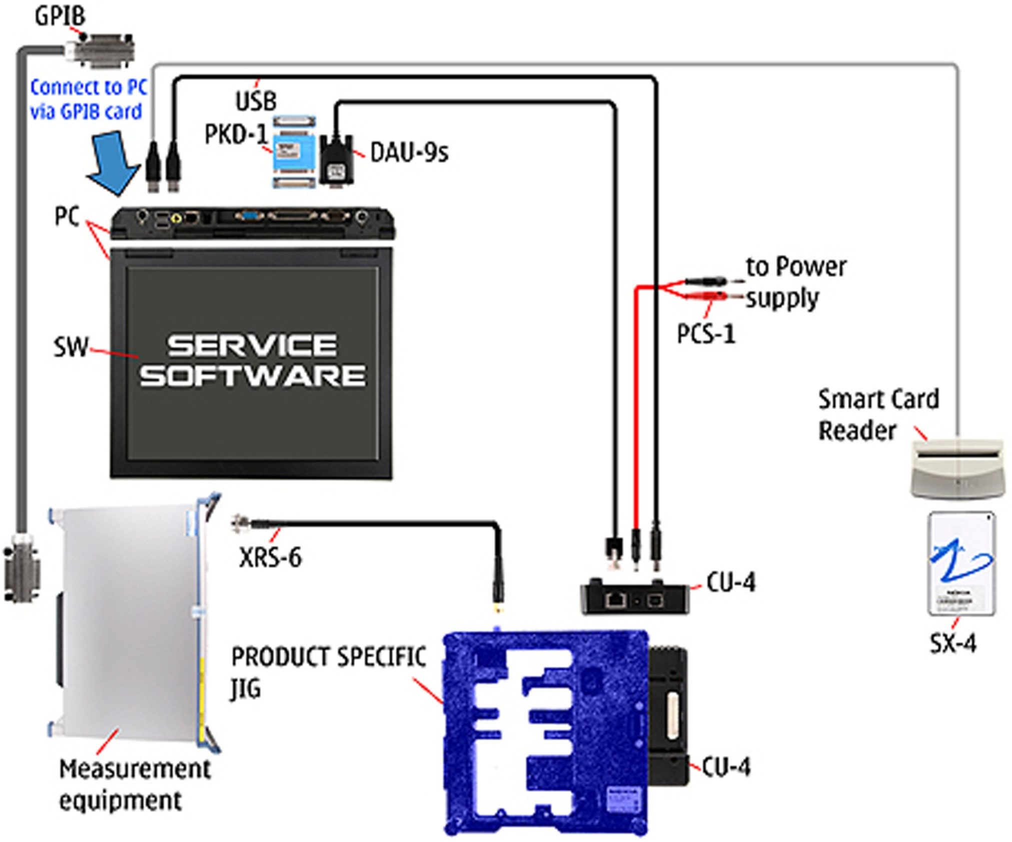

GPIB
Connect to PC via GPIB card
USB
PKD-1
DAU-9s
PC
SW
SERVICE SOFTWARE
to Power supply
PCS-1
Smart Card Reader
XRS-6
CU-4
PRODUCT SPECIFIC JIG
SX-4
Measurement equipment
CU-4

Figure 29 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific tools	
MJ-120	Module jig
Other tools	
CU-4	Control unit
SX-4	Smart card
	Measurement equipment
	Smart card reader
	PC with Phoenix service software
Cables	
DAU-9s	MBUS cable
PCS-1	DC power cable
PKD-1/PK-1	SW security device

Type	Description
XRS-6	RF cable
	GPIB control cable
	USB cable

Flash concept with FPS-10

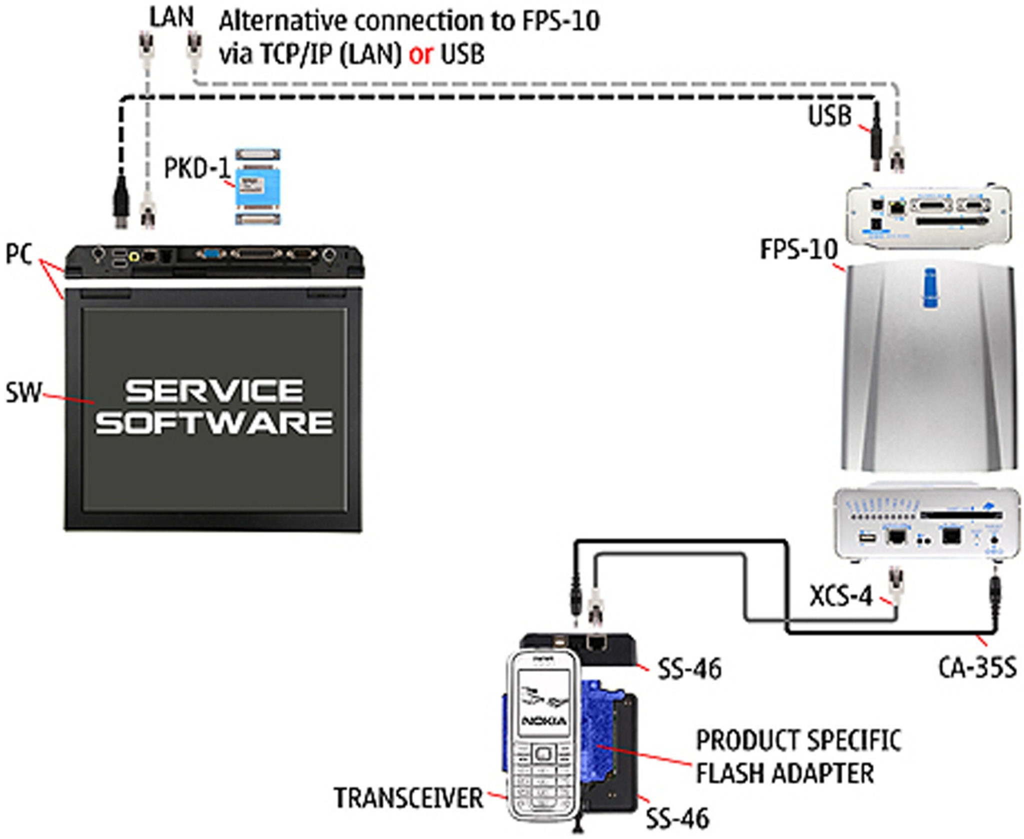

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
PC
FPS-10
SW
SERVICE
SOFTWARE
XCS-4
SS-46
CA-35S
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
SS-46

Figure 30 Basic flash concept with FPS-10

Type	Description
Product specific tools	
FS-45	Flash adapter
Other tools	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
CA-35S	Power cable

Type	Description
	USB cable

RF testing concept with RF coupler

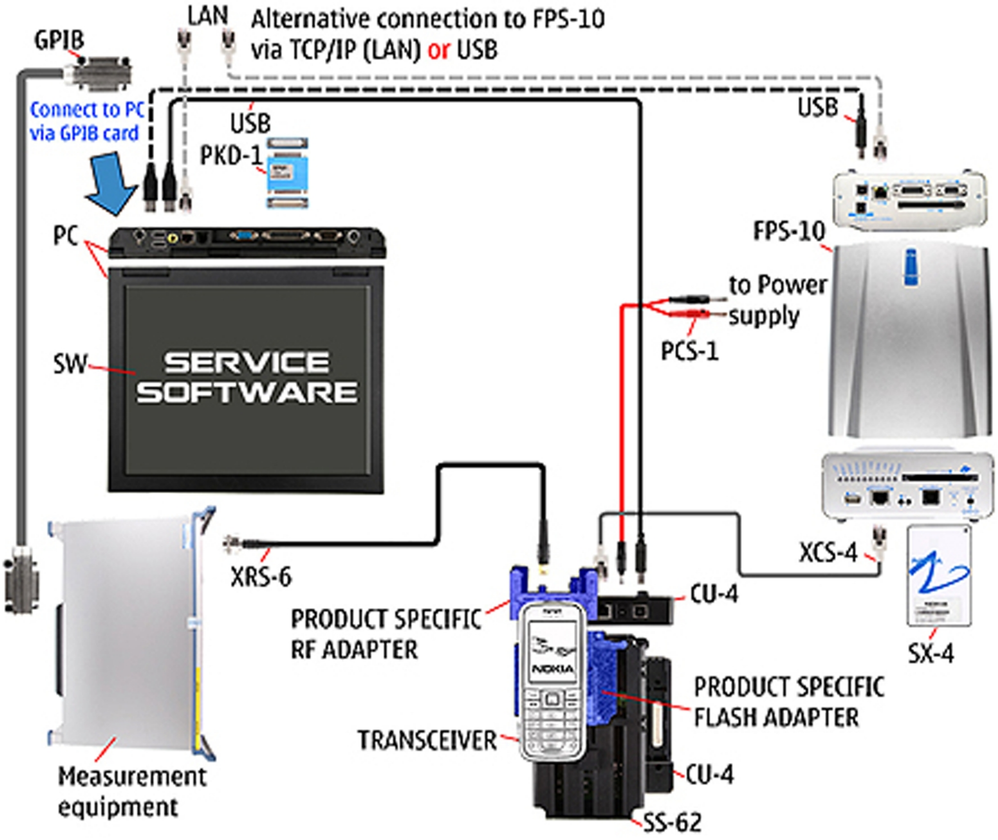

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
GPIB
Connect to PC
via GPIB card
USB
PKD-1
USB
PC
FPS-10
to Power
supply
PCS-1
SW
SERVICE
SOFTWARE
XRS-6
XCS-4
CU-4
PRODUCT SPECIFIC
RF ADAPTER
SX-4
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
CU-4
Measurement
equipment
SS-62

Figure 31 RF testing concept with RF coupler

Type	Description
Product specific tools	
FS-45	Flash adapter
	RF coupler
Other tools	
CU-4	Control unit
SX-4	Smart card
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software
Cables	
PCS-1	Power cable

Type	Description
XCS-4	Modular cable
XRS-6	RF cable
	GPIB control cable
	USB cable

CU-4 flash concept with FPS-10

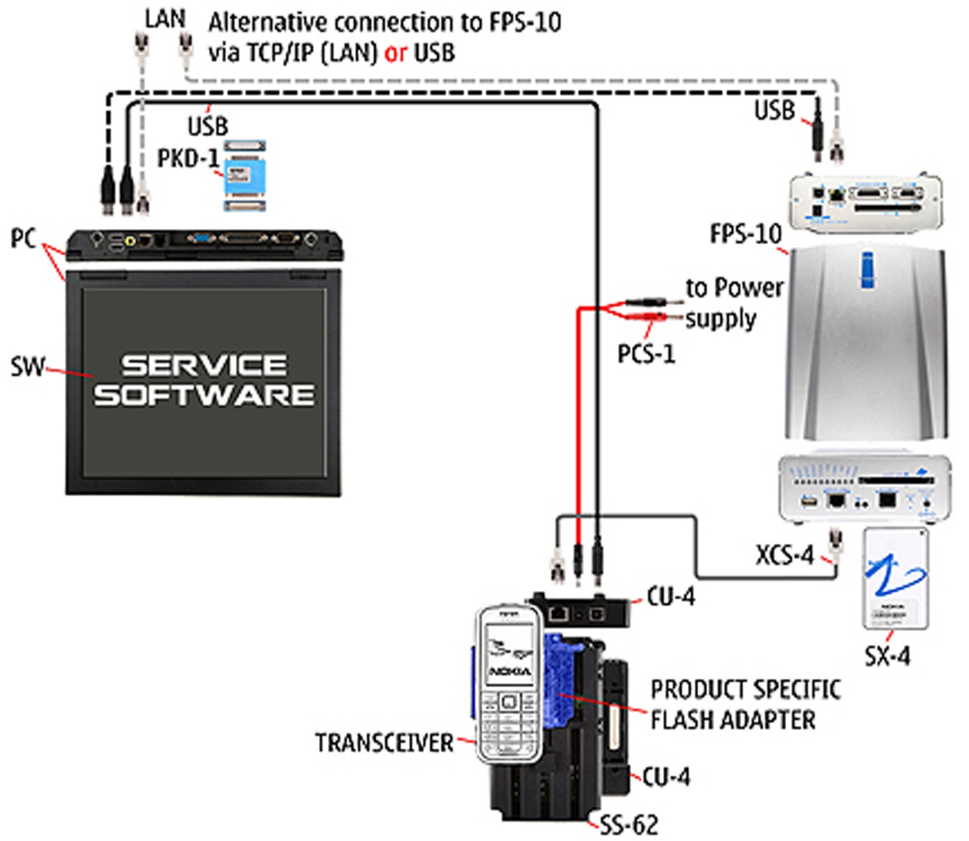

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
USB
PC
SW
SERVICE
SOFTWARE
FPS-10
to Power
supply
PCS-1
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
CU-4
SS-62

Figure 32 CU-4 flash concept with FPS-10

Type	Description
Product specific tools	
FS-45	Flash adapter
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	

Type	Description
PCS-1	Power cable
XCS-4	Modular cable
	Standard USB cable
	USB cable

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5 — Disassembly / Reassembly Instructions

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Table of Contents

Disassembly/reassembly instructions 5–5

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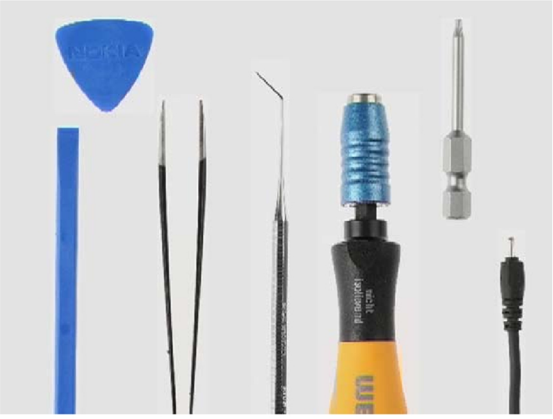
Disassembly/reassembly instructions

Prerequisites

- Reassembly takes place in the reverse order.

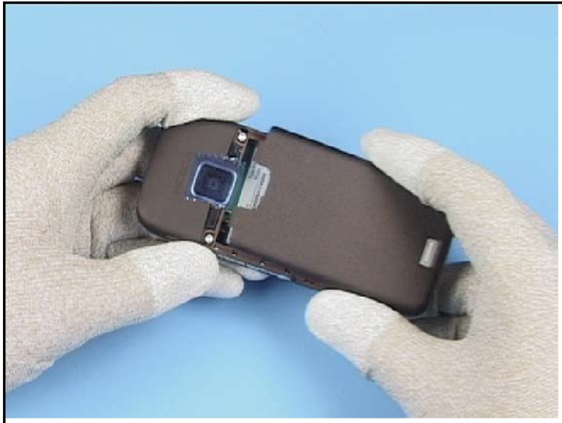
Steps

1. DISASSEMBLY INSTRUCTION

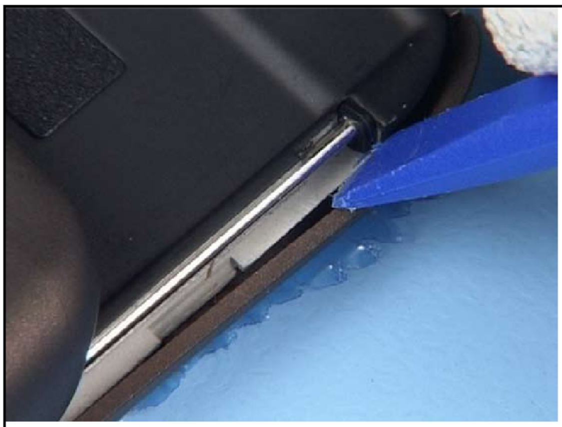


1. Needed tools: The SS-93, the SRT-6, metal tweezers, the dental pick, a bit holder with a Torx Plus size 6 bit and a dc plug.

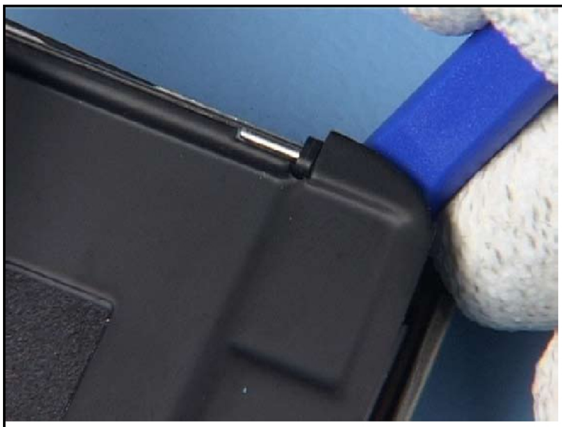
2. Always cover the windows with a protective film.



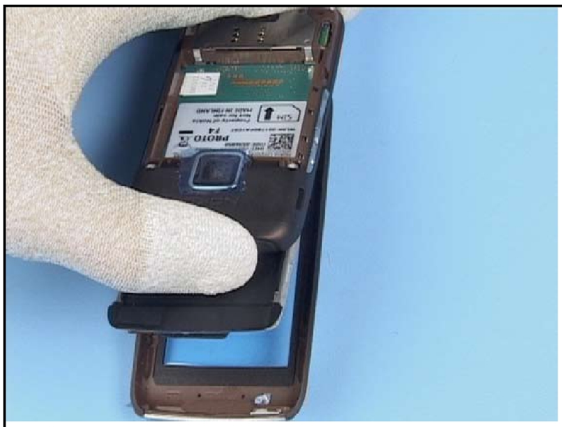
3. Unlock and remove the BATTERY COVER.



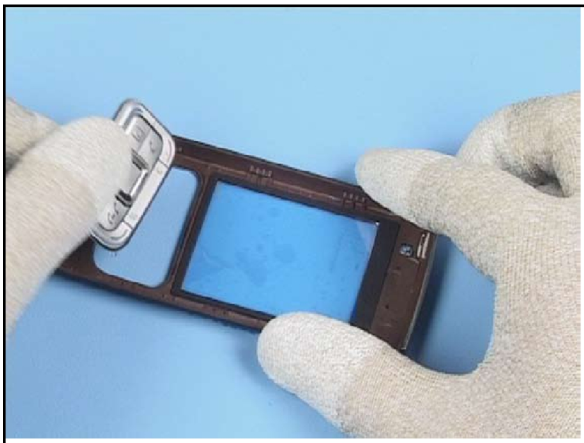
4. Shift open the assembly. Carefully pry open the clips of the A-COVER with the SS-93...

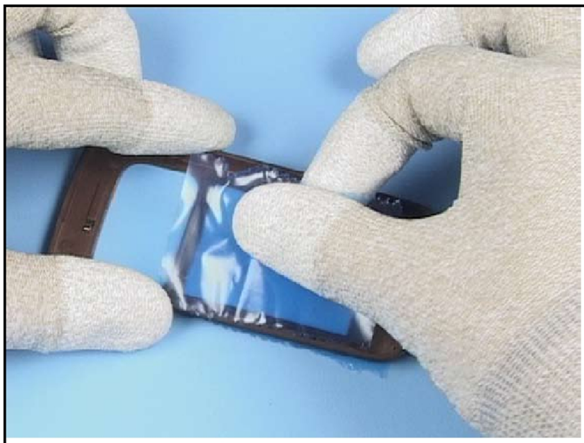


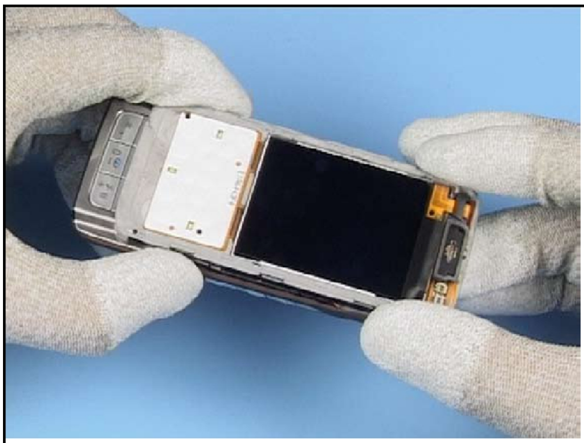
5. ...on both sides.

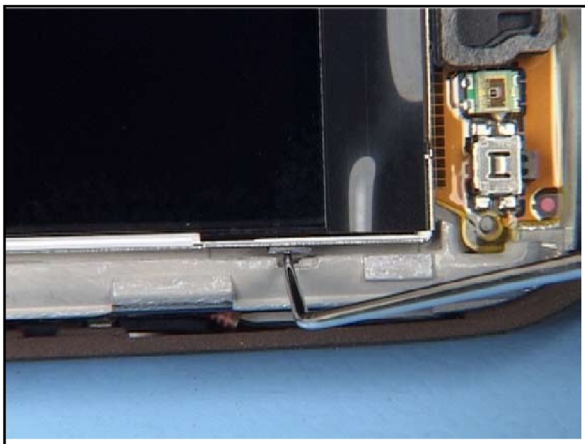


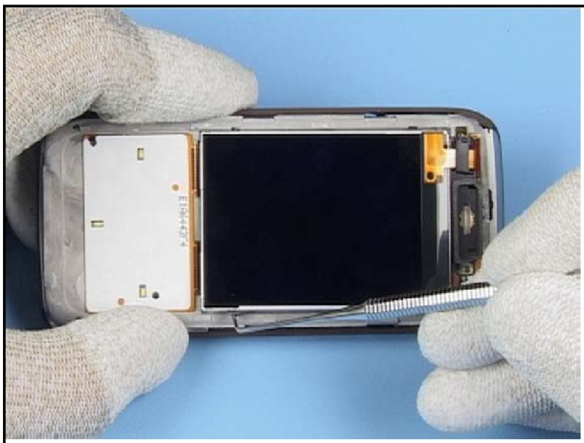
6. Lift up the whole assembly.

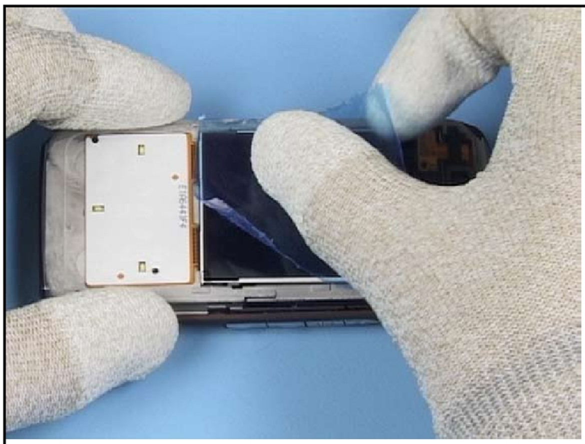

7. Remove the S60 KEYMAT.

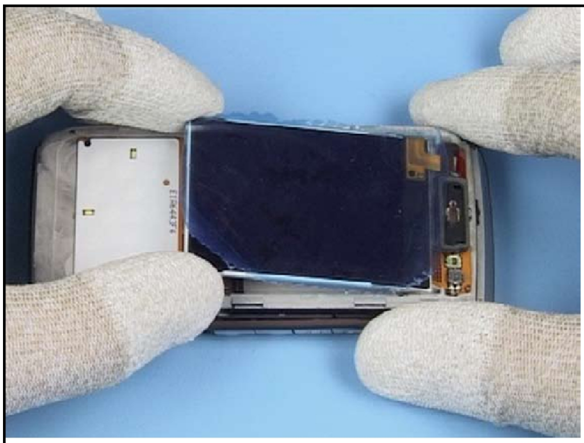

8. Protect the window from inner side.


9. Shift together the assembly.

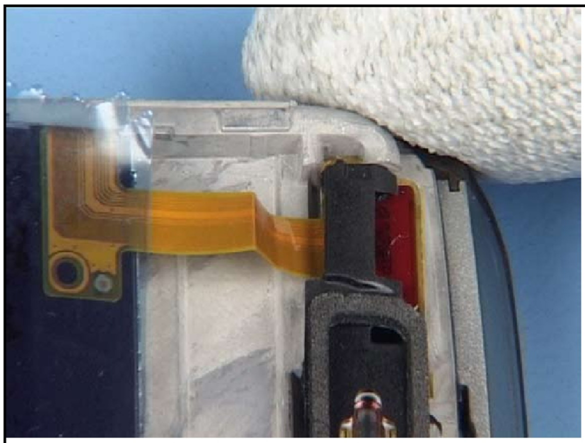

10. Carefully bend open the metal snaps of the DISPLAY HOLDER ASSEMBLY.


11. ...on both sides.

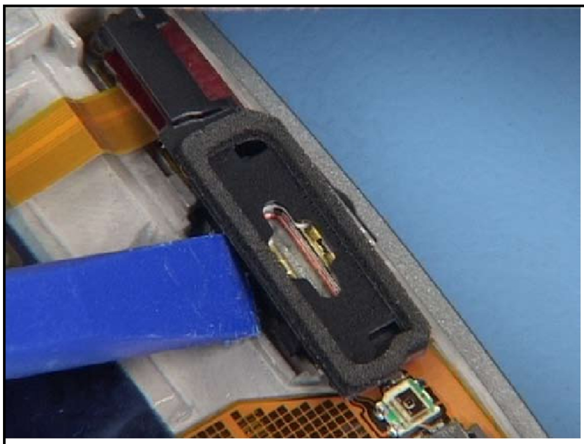

12. Cover the LCD with a protective film.



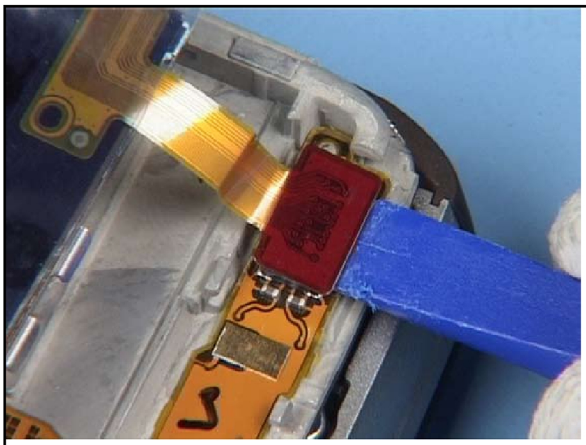
13. Lift up the whole display assembly.



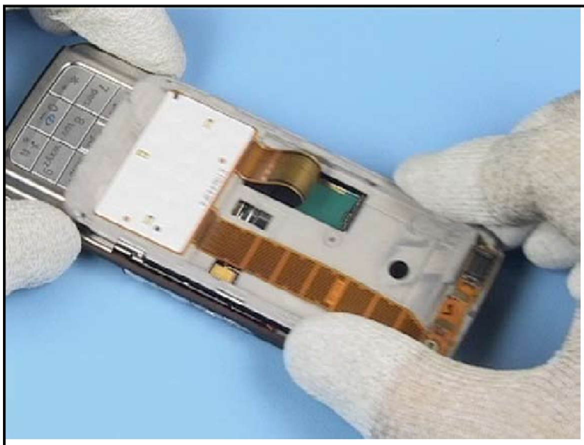
14. Carefully bring it into position shown to gain the maximum flex foil lengths.



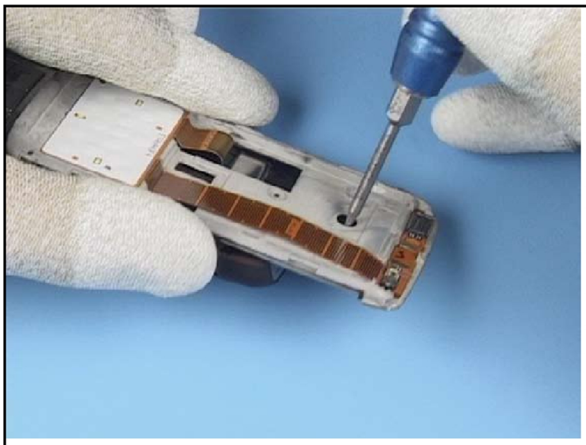
15. Lever out the EARPIECE HOLDER ASSEMBLY.



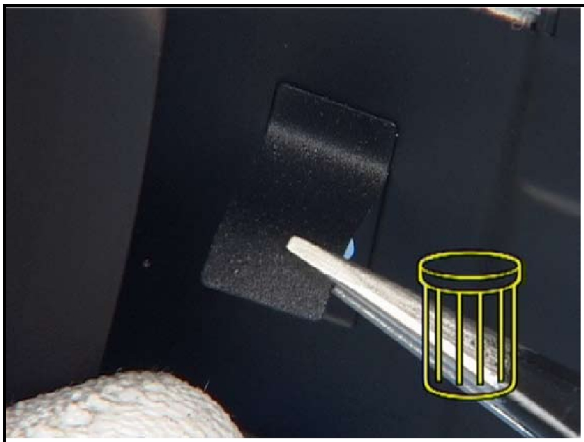
16. Open the flex connector of the display.



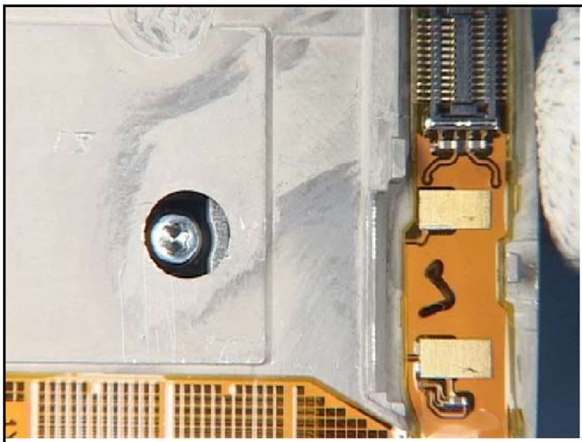
17. Shift open the assembly.



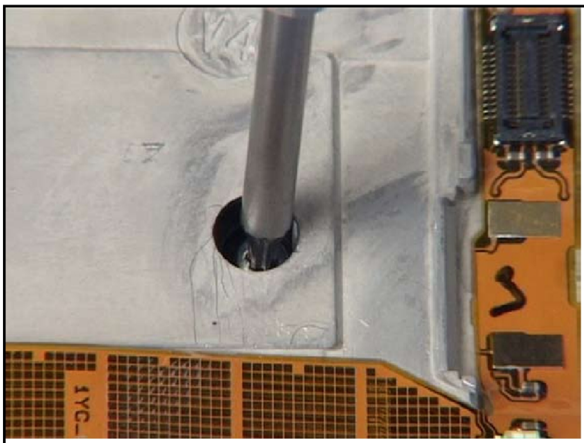
18. Push out the glued in MASKING PLATE and discard it.



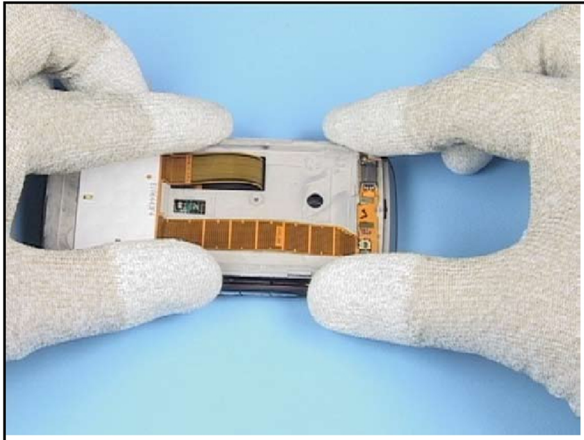
19. It can’t be used again.



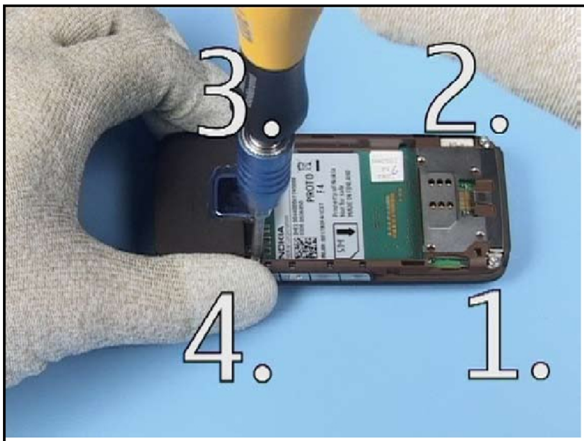
20. Align the recess of the slider to reach the screw and keep it into position.



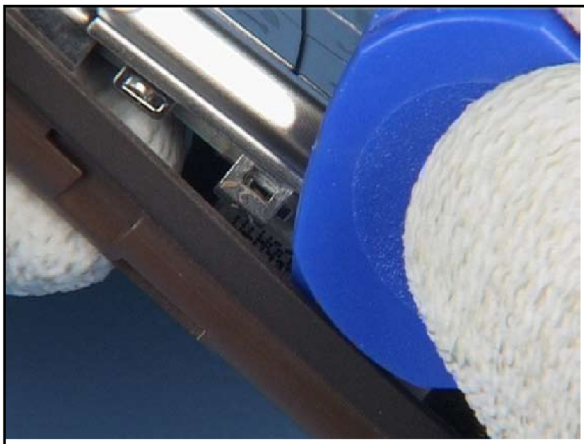
21. Unscrew this screw and remove it before continue.



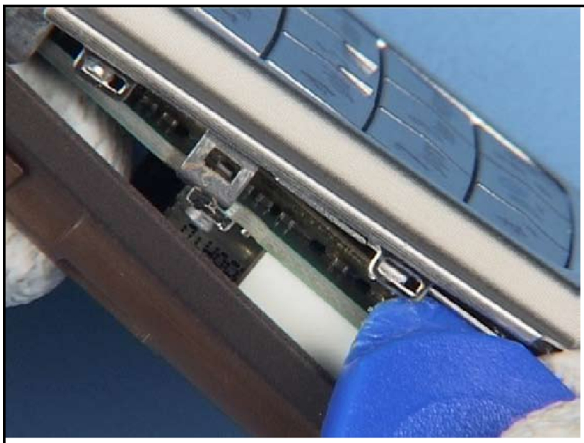
22. Close the assembly.



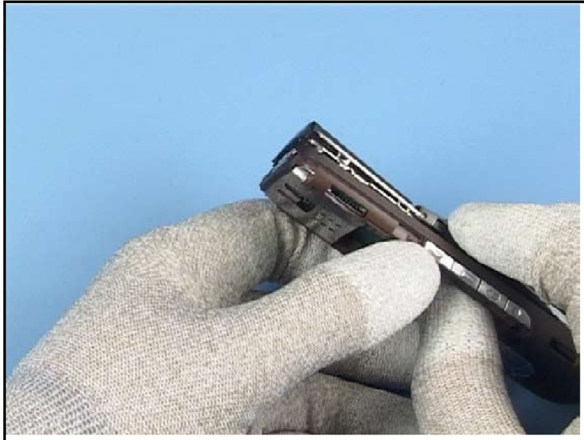
23. Unscrew these 4 screws in the order shown.



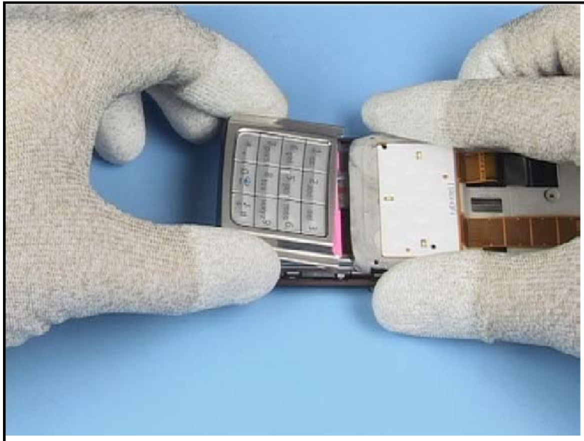
24. Shift open the assembly. Gently pry open these clips of the B-COVER with the SRT-6 in order to reach the clips of the T9 KEYMAT.



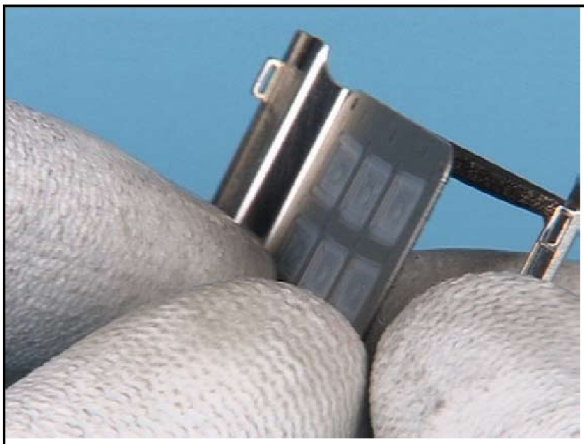
25. Now unlock the metal latches of the KEYMAT...



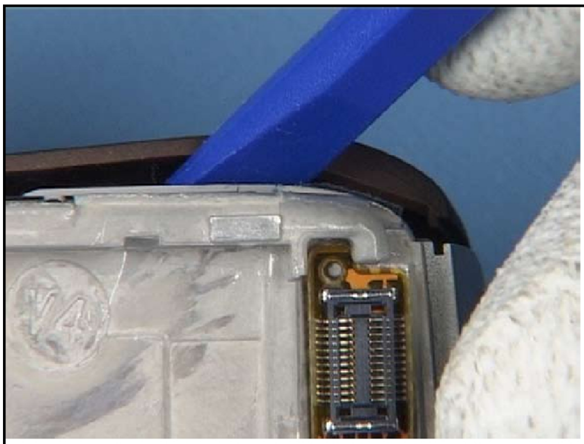
26. ... on both sides.



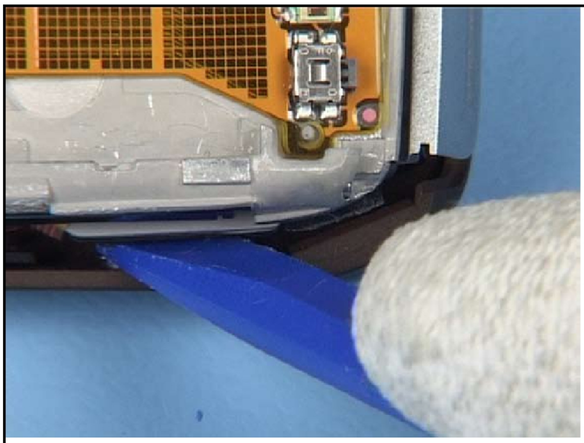
27. Carefully remove the SHEET METAL ASSEMBLY.



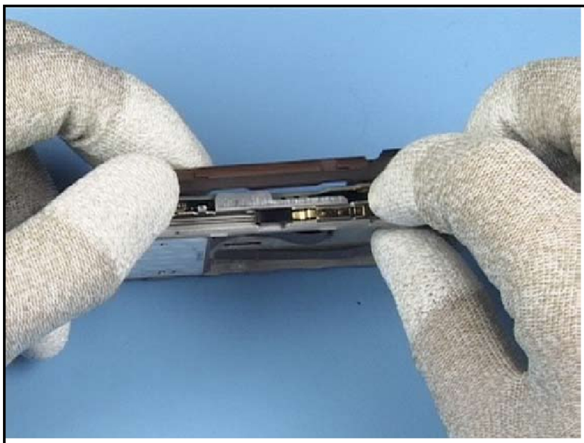
28. Remove the glued in T9 KEYMAT.



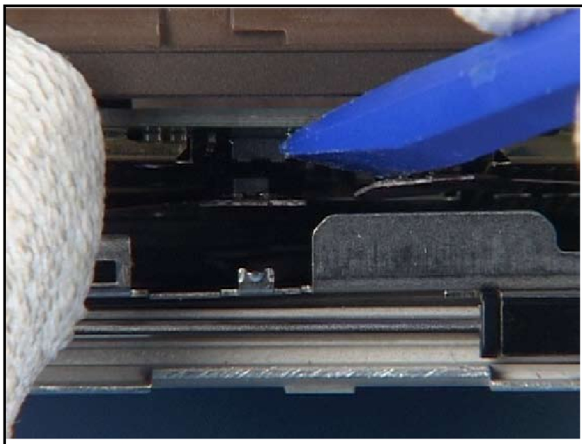
29. Unlock the snaps...



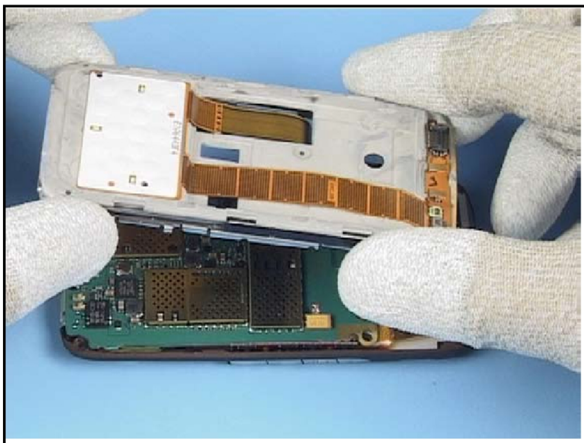
30. ... on both sides.



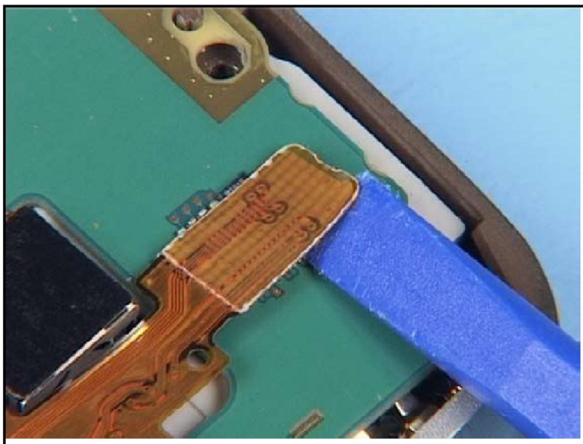
31. Separate the cover slightly. Keep in mind that flex foils are still connected.



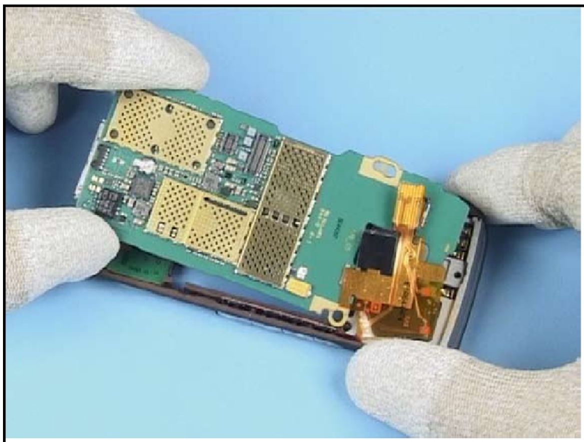
32. Open these 2 connectors with the SS-93 carefully.



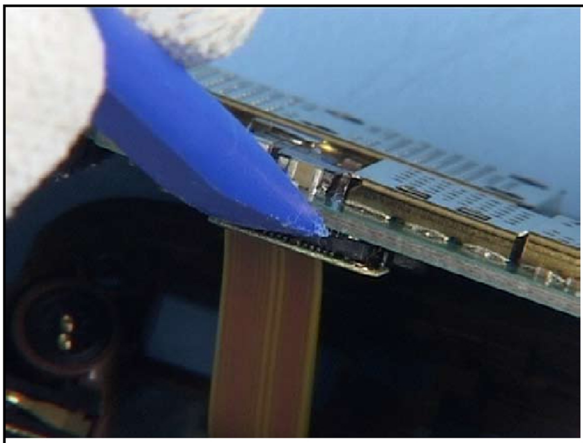
33. Now the SLIDE MODULE ASSEMBLY can be removed.



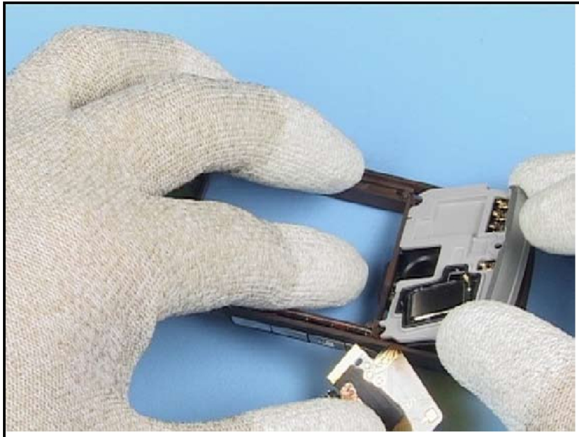
34. Disconnect the camera connector.



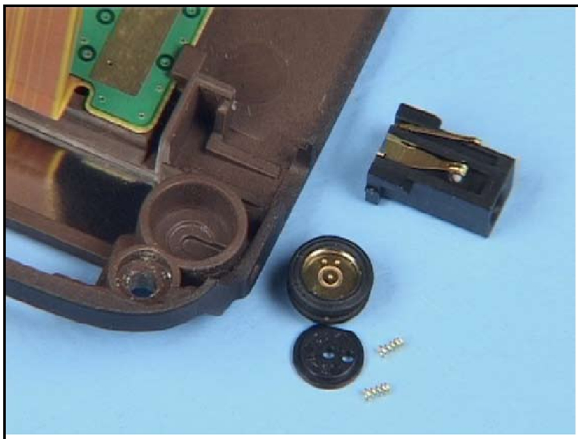
35. Lift up the ENGINE MODULE. Keep in mind that the flex foil is still connected.



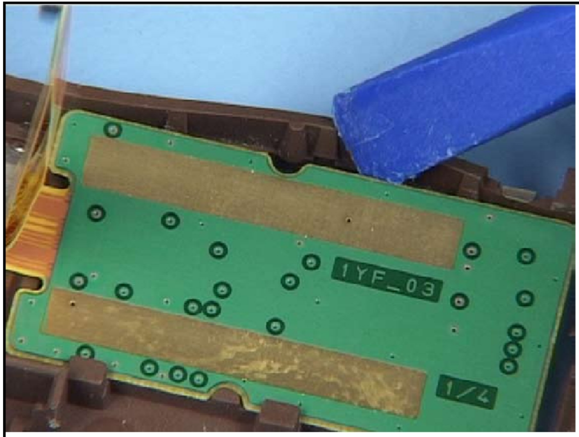
36. Disconnect the flex foil.



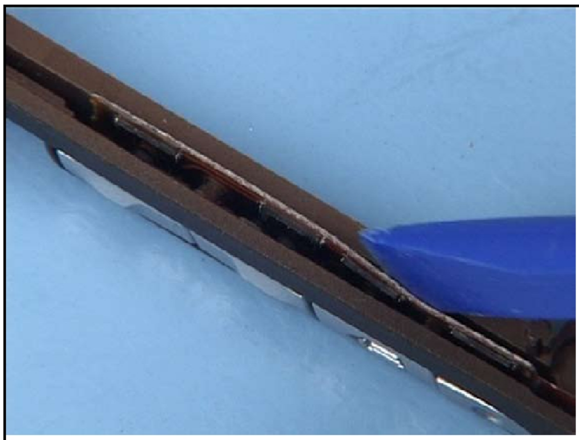
37. Lift out the ANTENNA MODULE ASSEMBLY.



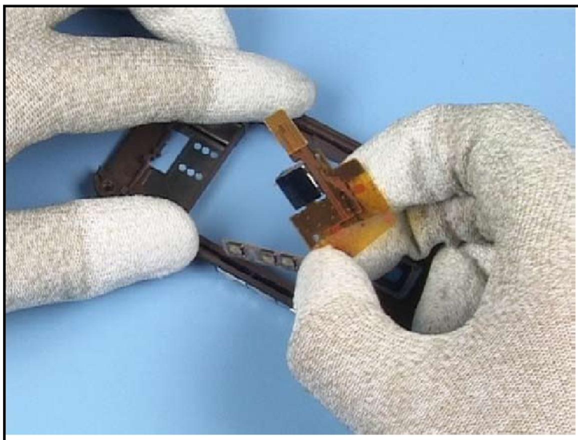
38. Remove the MICROPHONE and the DC JACK. The MICROPHONE will be destroyed surely and must be renewed when reassemble.



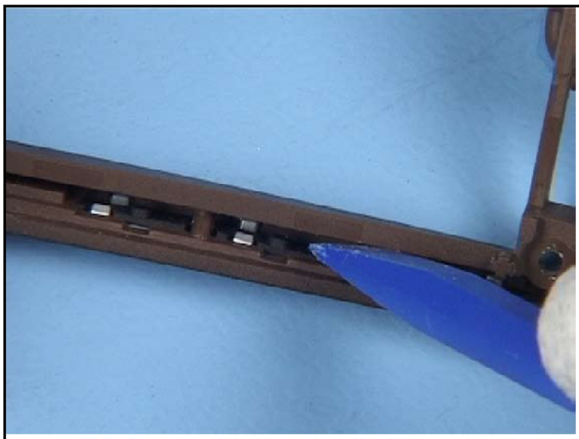
39. Gently pry out the 1YF SIM CARD MODULE and remove it.



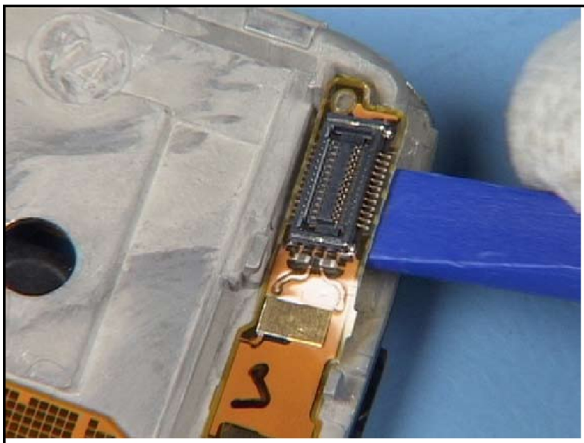
40. Carefully release the glued in CAMERA FLEX ASSEMBLY.



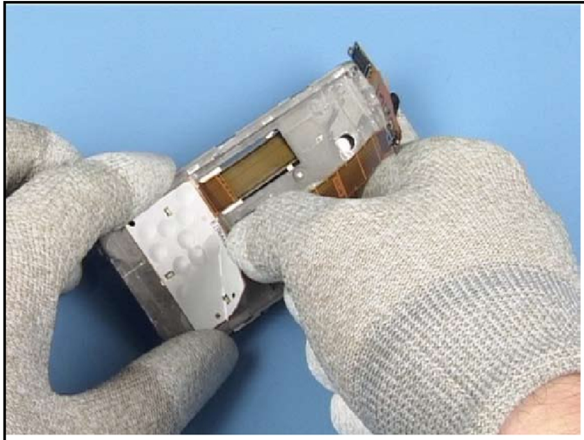
41. Now it can be removed easily.



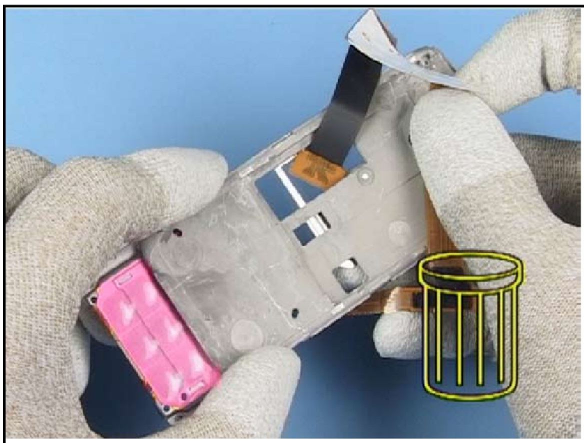
42. Unlock all clips of the SIDE KEYS. Note that these clips are very delicate and can break easily.



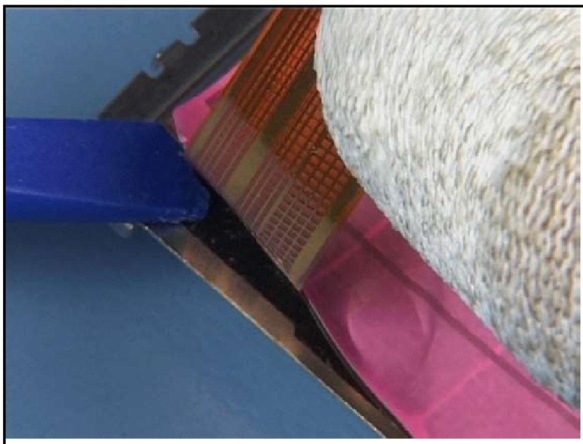
43. Lift up the 1YC UI FLEX ASSEMBLY.



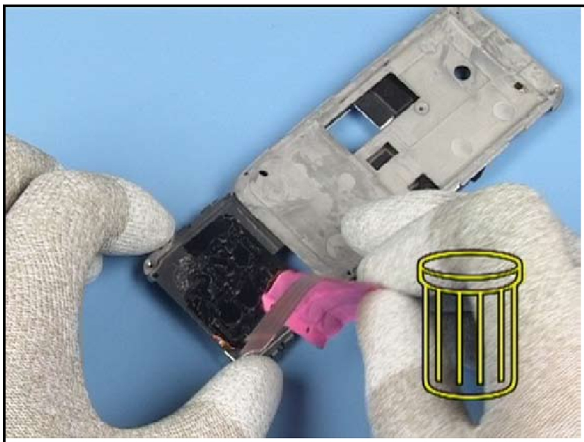
44. Peel it up completely.



45. It can’t be used again. Remove all adhesive residues before reassemble.



46. Peel up the T9 FLEX ASSEMBLY, beginning from the connector side.

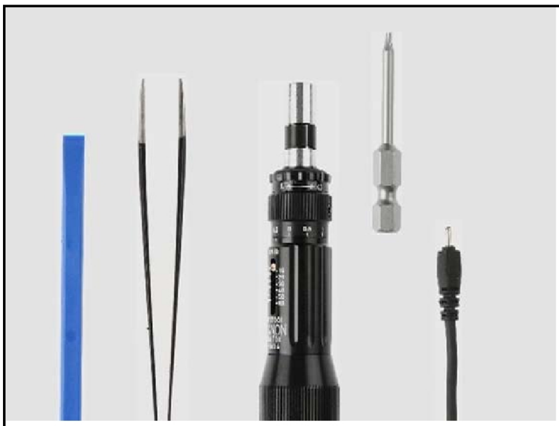


47. It can’t be used again.

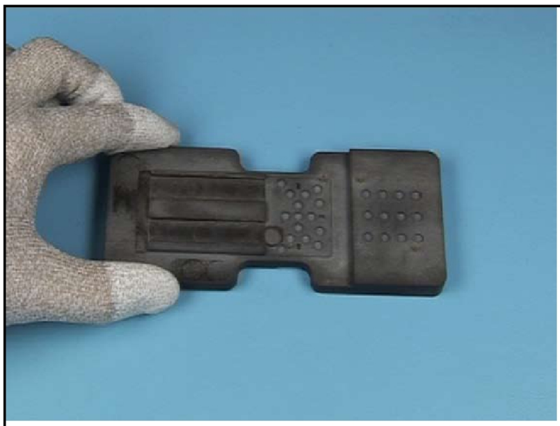
48. Remove any adhesive residues before reassemble.

49. The disassembly procedure is now complete.

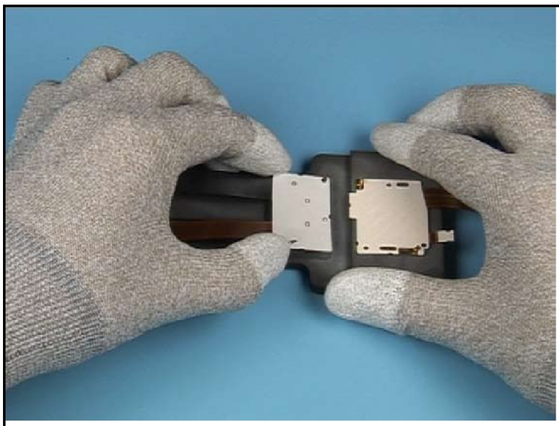
ASSEMBLY INSTRUCTION



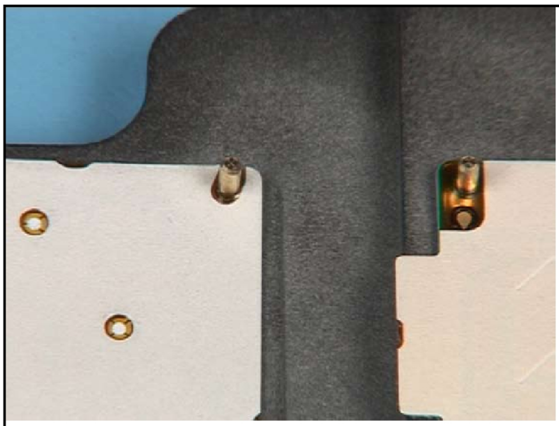
1. Needed tools: The SS-93, metal tweezers, a torque driver with a Torx Plus size 6 bit and a DC plug.



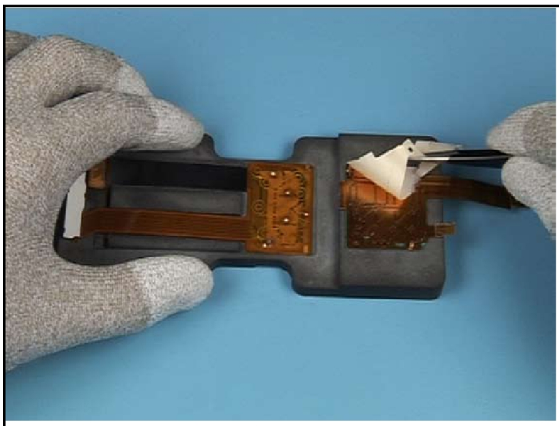
2. The SS-110 Alignment tool is also needed for correct placement of the flex foils.



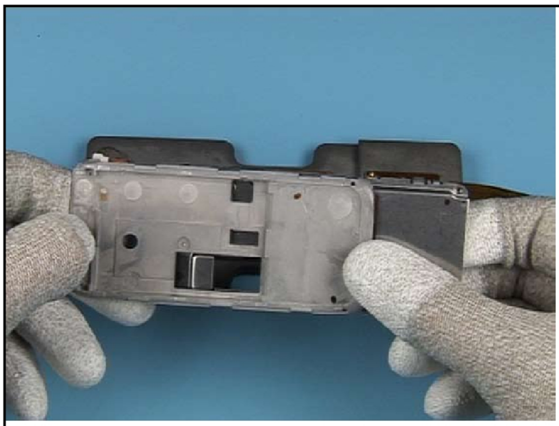
3. Place the flex foil assemblies.



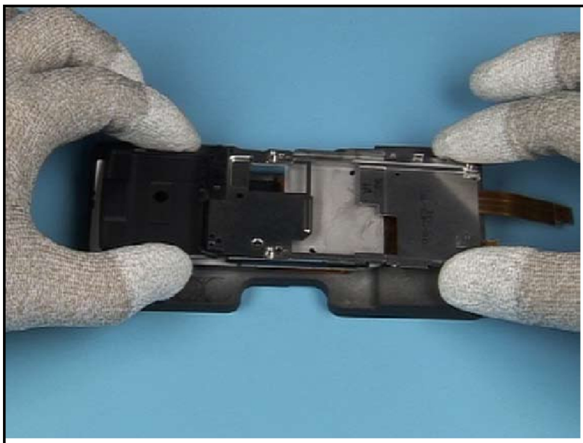
4. Mind the guide.



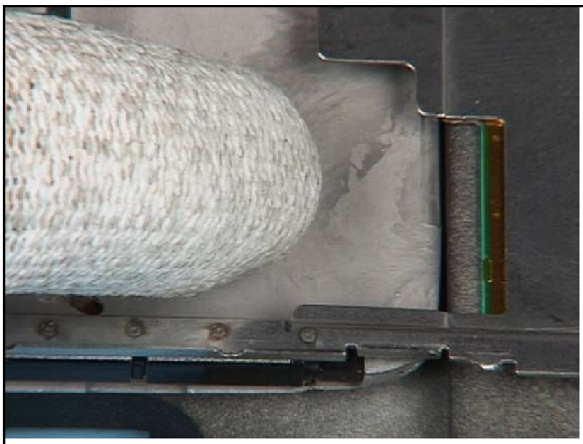
5. Remove all protective films.



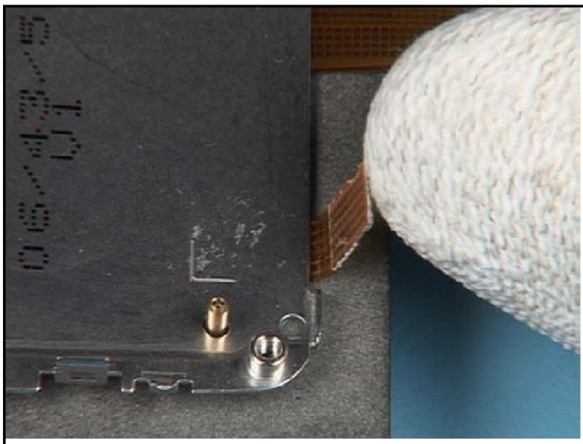
6. Bring the slider into position shown.



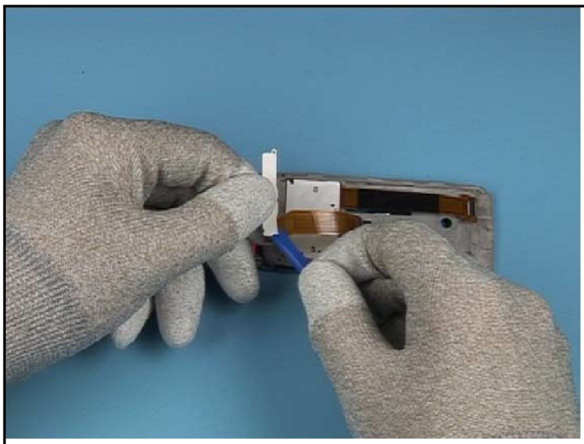
7. Position it over the flex foil assemblies, mind the guides.



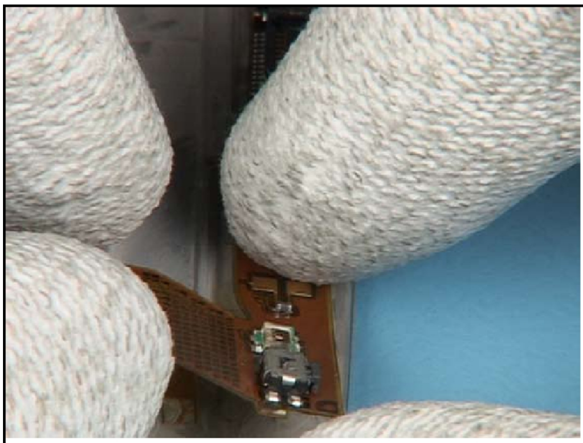
8. Push it down slightly.



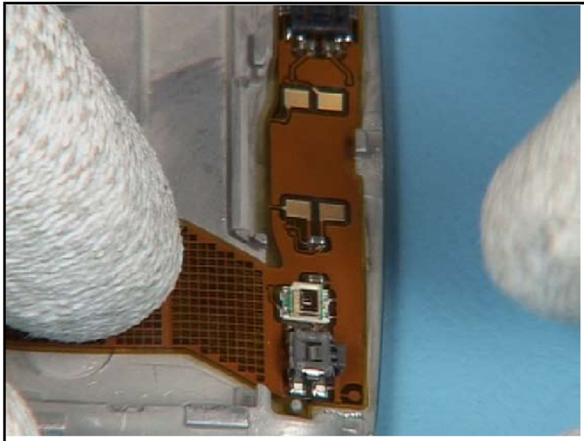
9. Bend over this contact foil and fix it.



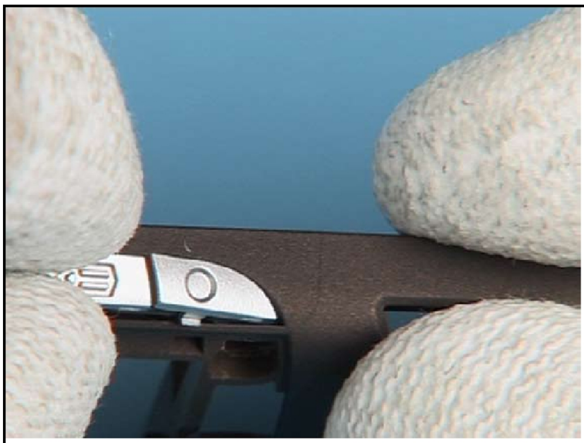
10. Lift up the SLIDE MODULE ASSEMBLY and turn it. Remove this protecting film.



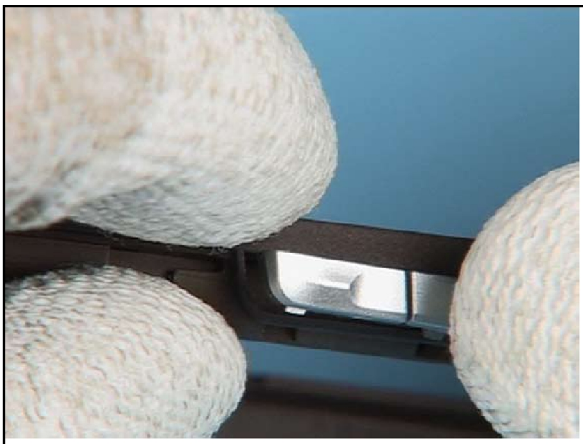
11. Position it as shown, smooth it down evenly.



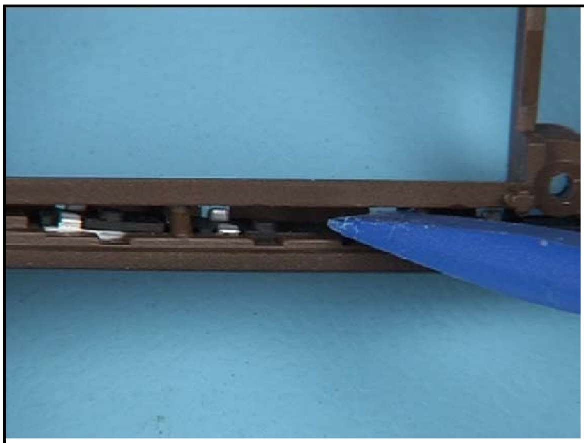
12. Mind the alignment tabs.



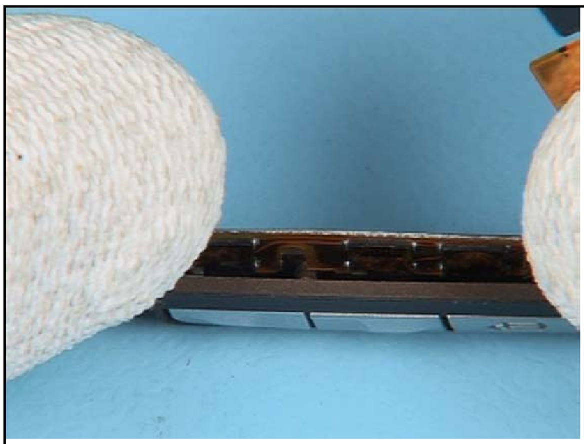
13. Insert the SIDE KEYS.



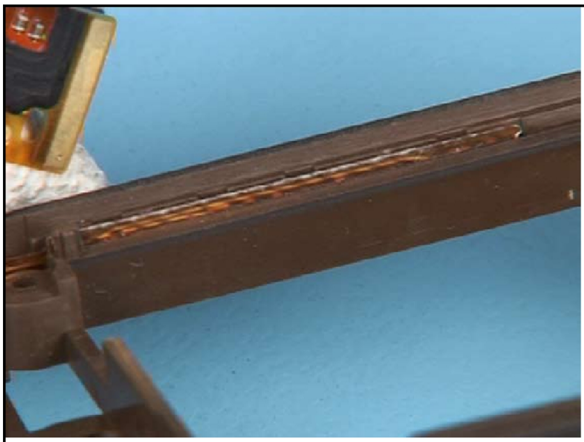
14. Push it down slightly, click all snaps into their places.



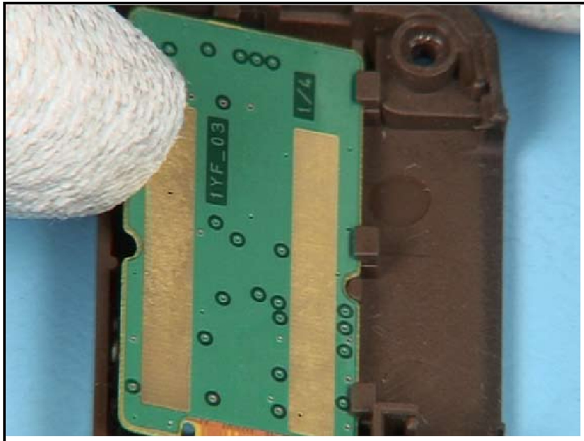
15. Position them with the SS-93.



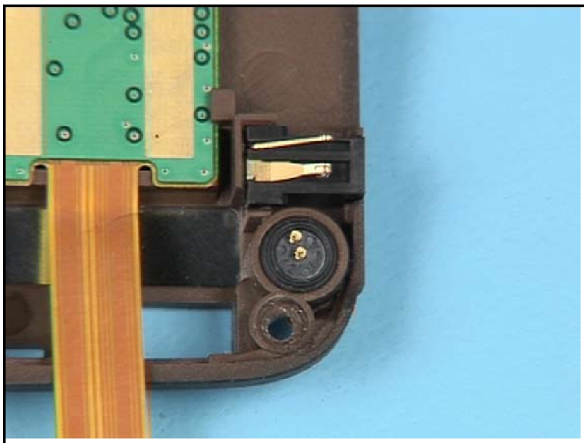
16. Insert the CAMERA FLEX ASSEMBLY.



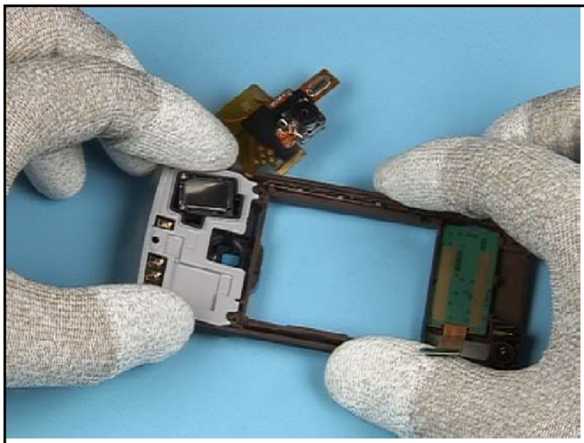
17. Check the correct positioning before continue.



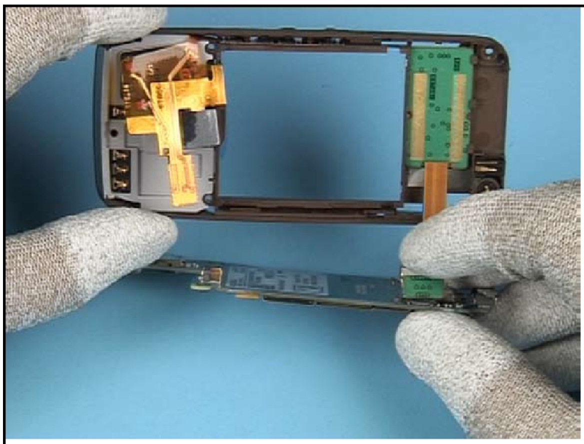
18. Insert the SIM CARD MODULE and click it into its place.



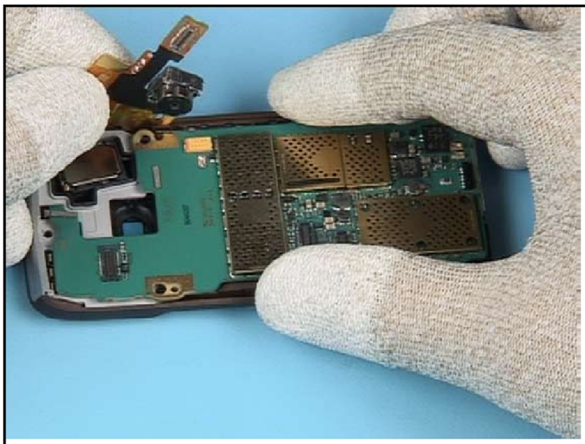
19. Insert the MICROPHONE and CD JACK.



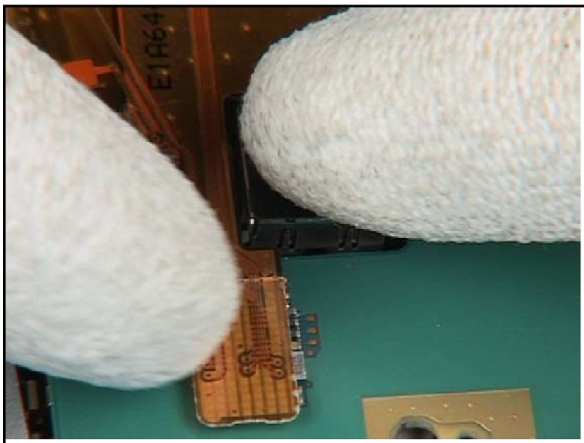
20. Insert the ANTENNA MODULE ASSEMBLY.



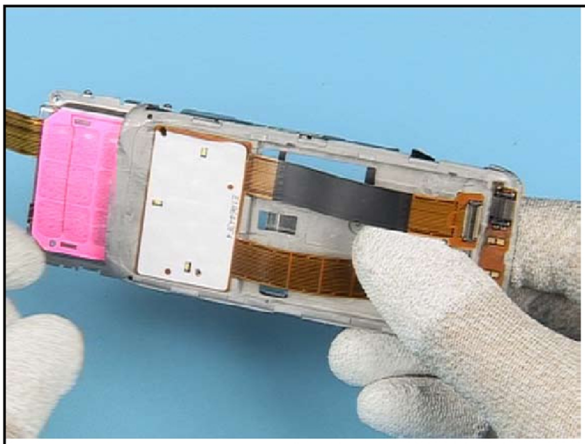
21. Close the connector of the SIM CARD MODULE.



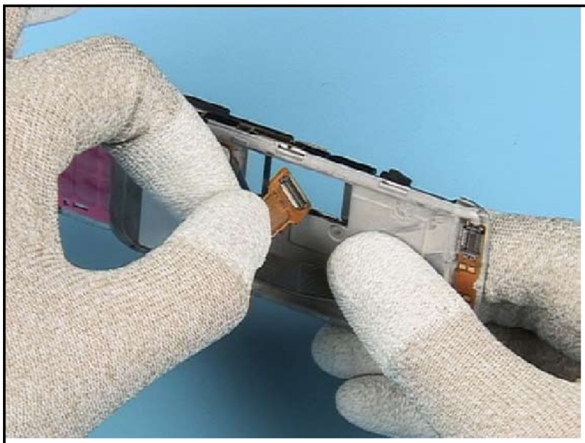
22. Position the ENGINE MODULE into the B-COVER ASSEMBLY.



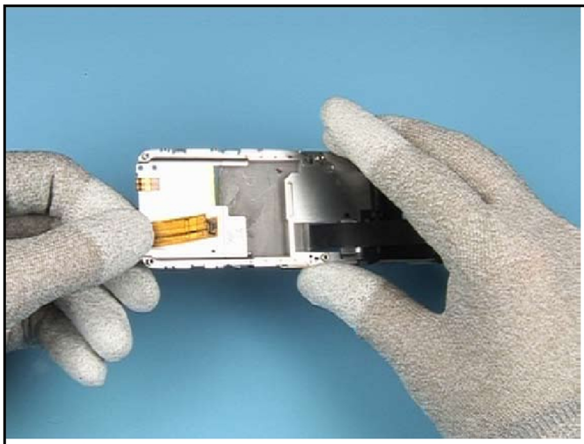
23. Close the connector of the CAMERA FLEX ASSEMBLY.



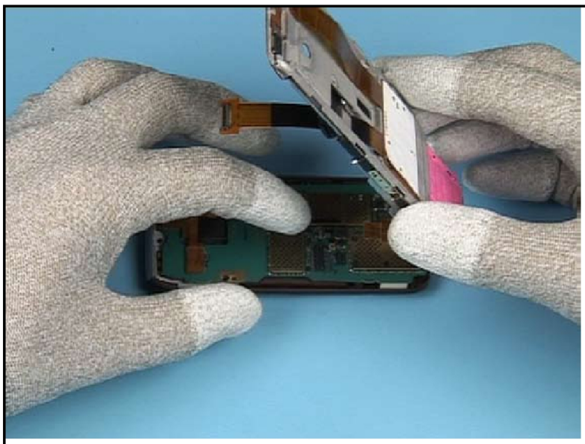
24. Bring the SLIDE MODULE ASSEMBLY into position shown.



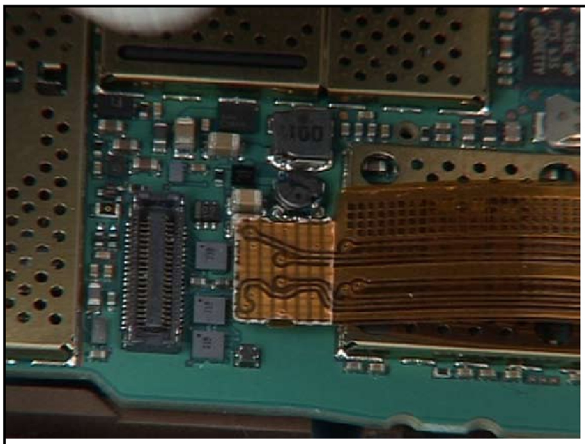
25. Slot the connector through the recess as shown.



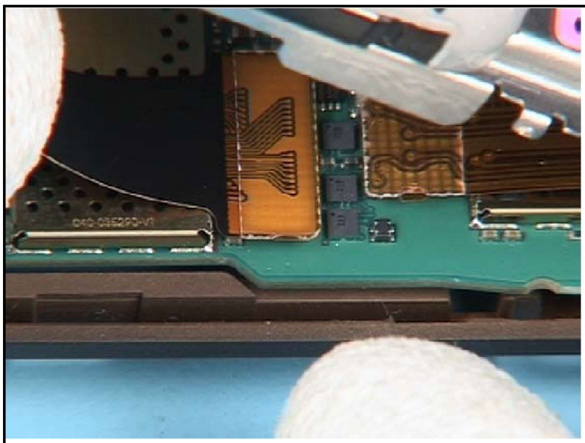
26. Bend over the 2nd flex foil as shown.



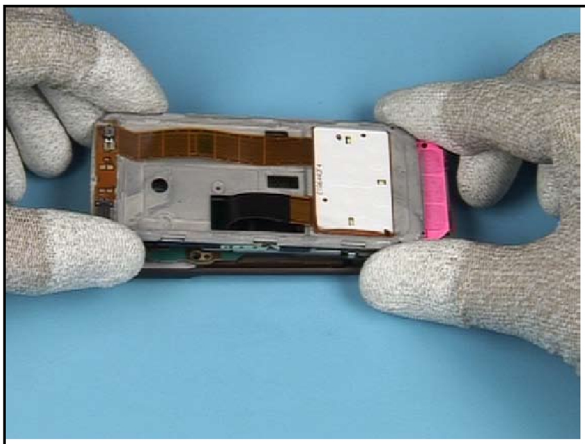
27. Now position the SLIDE MODULE ASSEMBLY over the B-COVER ASSEMBLY.



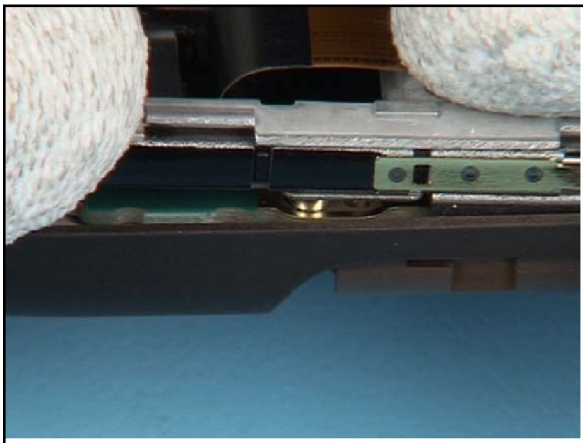
28. Close this connector first.



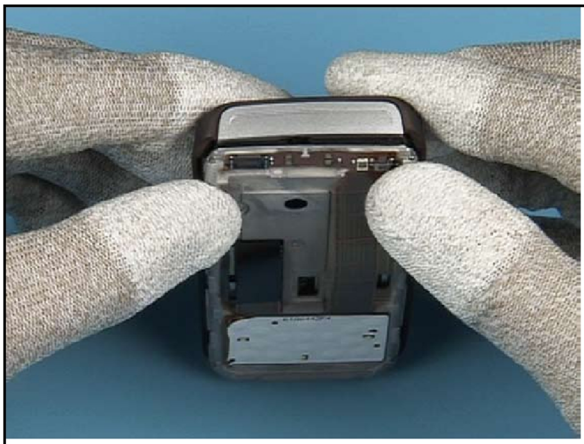
29. Move the SLIDE MODULE ASSEMBLY down and close the 2nd connector.



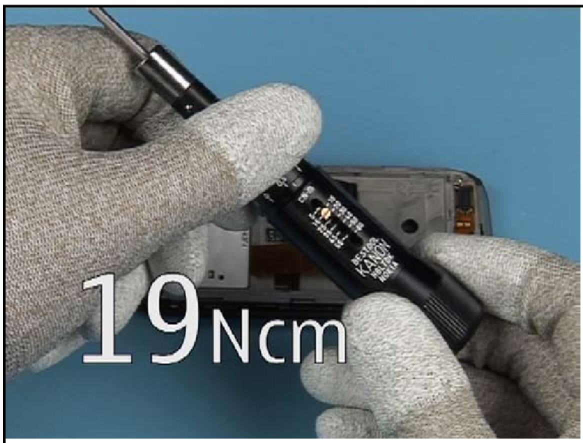
30. Now close the slider slowly and align it to the B-COVER ASSEMBLY.



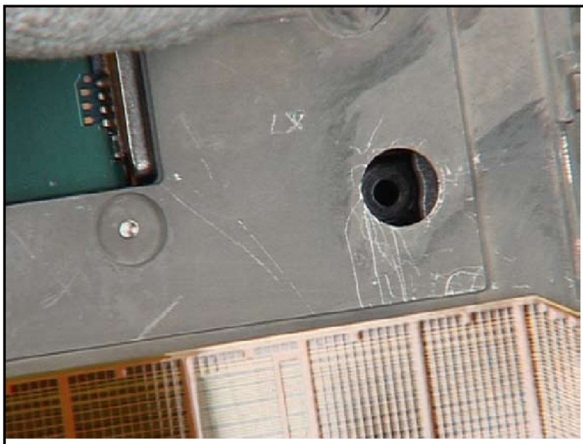
31. Mind this guide.



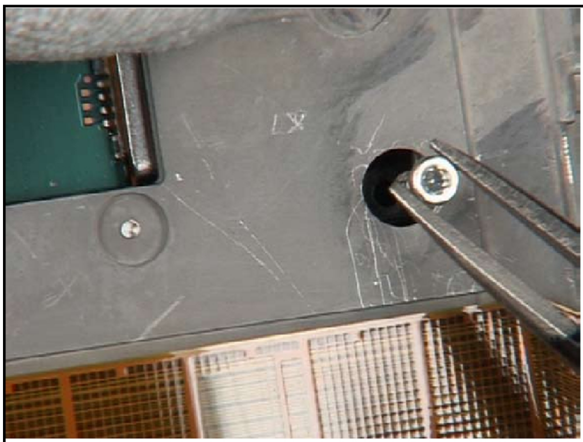
32. Click these 2 top snaps into their places.



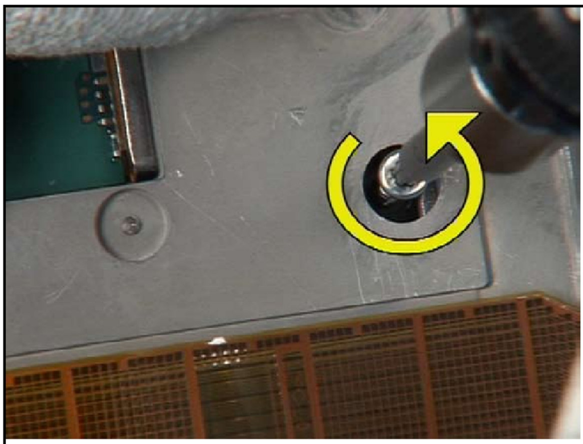
33. Set the correct torque for the single screw.



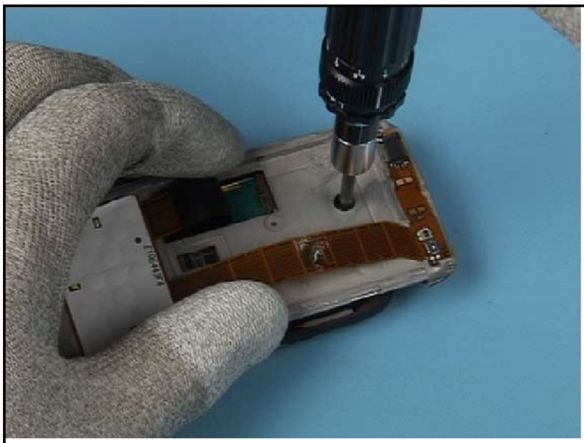
34. Bring the SLIDE MODULE ASSEMBLY into position shown to reach the hidden thread.



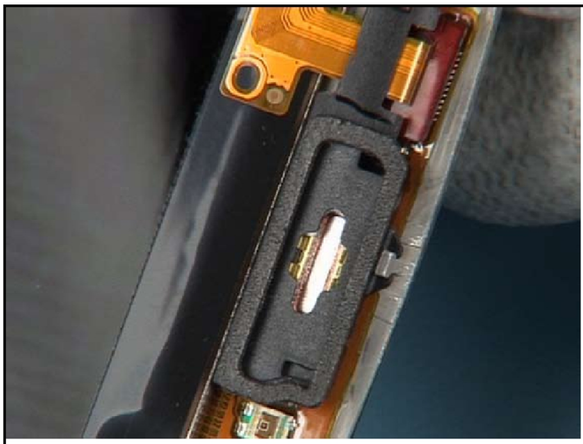
35. Hold the slider into position. Insert the screw.



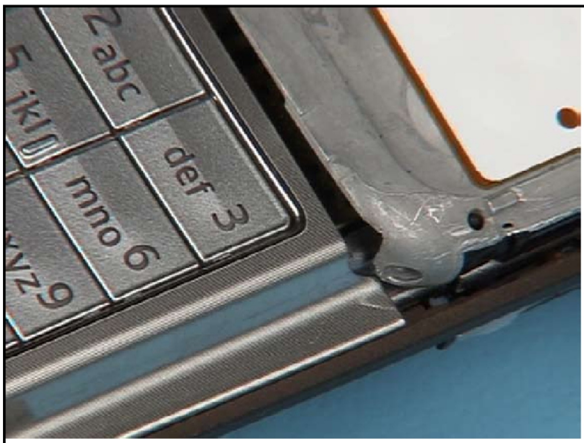
36. To prevent destroying the plastic thread, turn the screw to the left first.



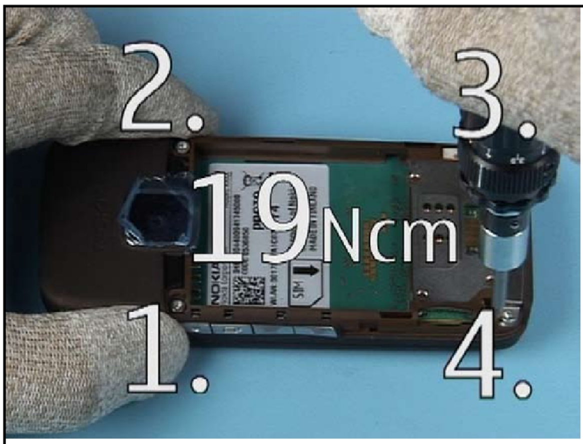
37. Then tighten it to the correct torque.



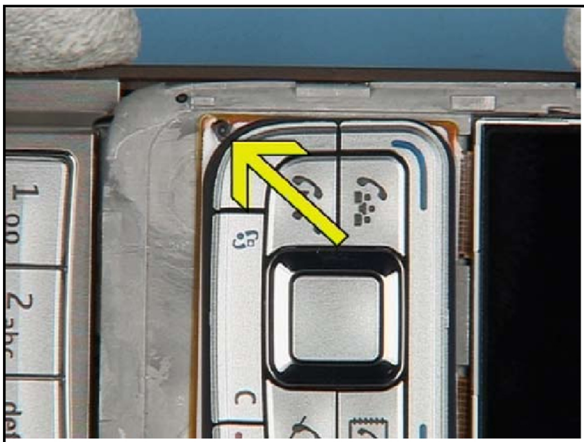
38. Mind the correct placement of the EARPIECE HOLDER ASSEMBLY.



39. Check that the SHEET METAL ASSEMBLY was positioned correctly to ensure the correct functionality of the slider.



40. Tighten the 4 screws in the order shown.



41. Insert the S60 KEYMAT first before placing the A-COVER ASSEMBLY. Mind the guide.

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6 — BB Troubleshooting and Manual Tuning Guide

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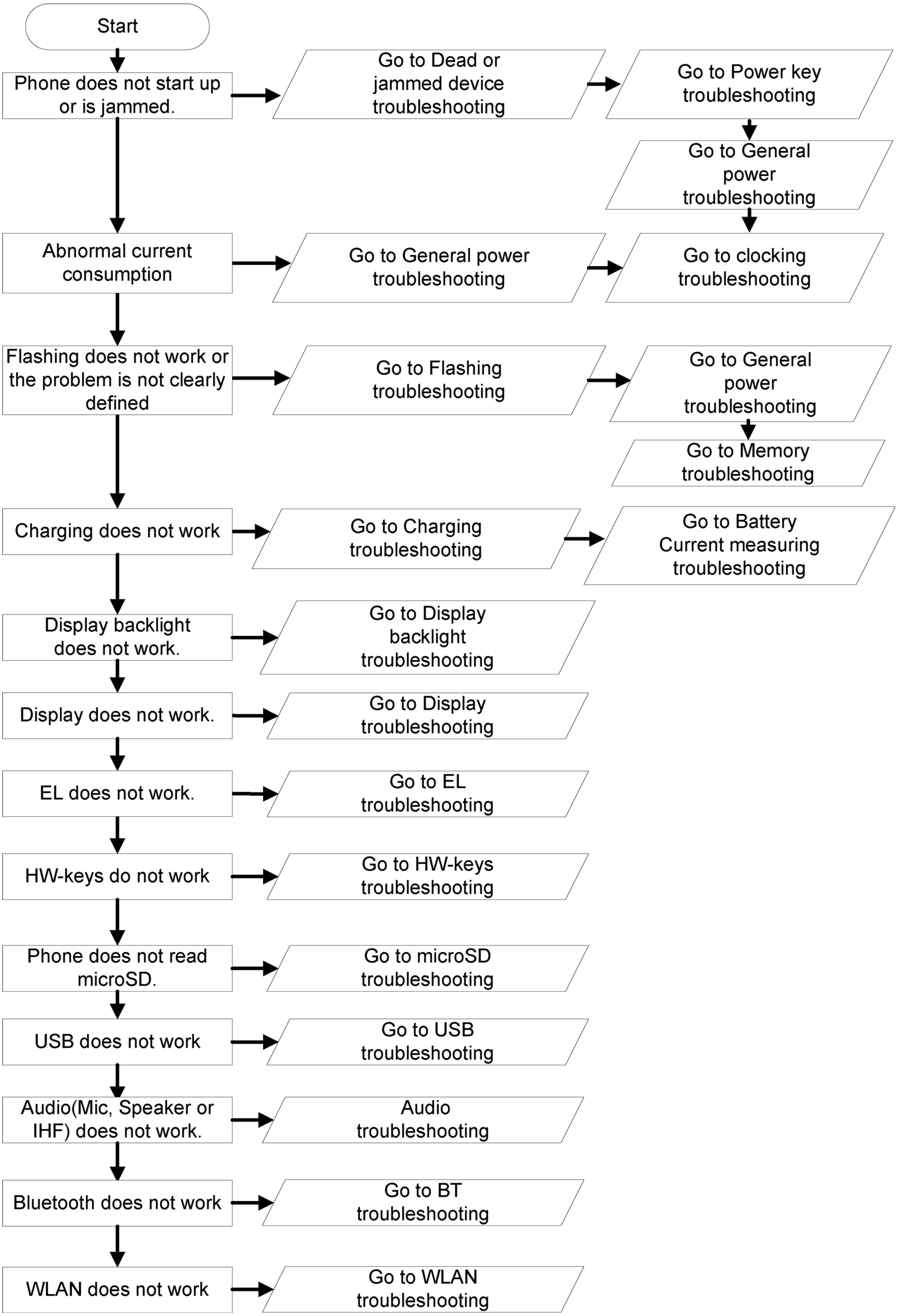
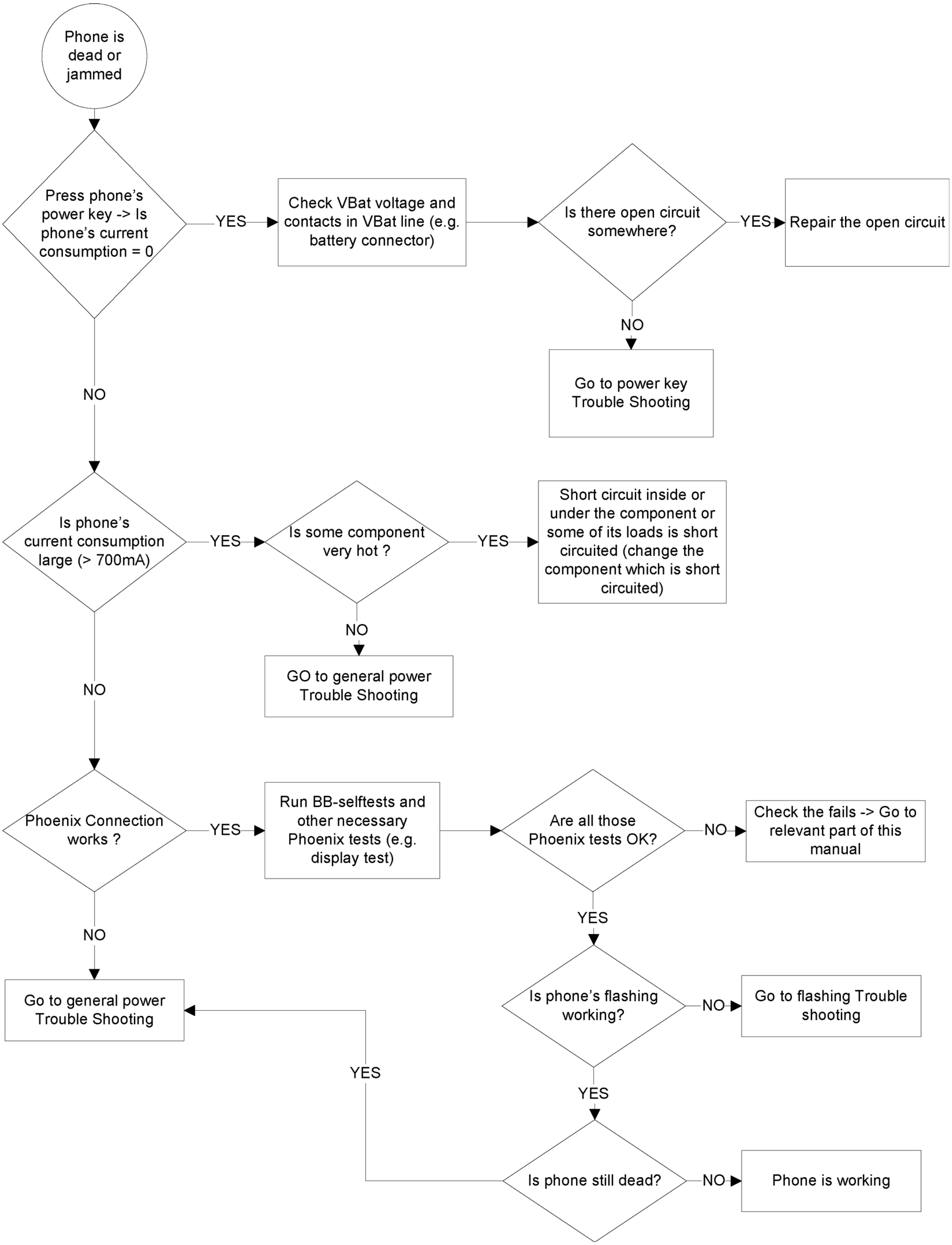
Baseband main troubleshooting

Troubleshooting flow


Start
Phone does not start up or is jammed.
Go to Dead or jammed device troubleshooting
Go to Power key troubleshooting
Go to General power troubleshooting
Abnormal current consumption
Go to General power troubleshooting
Go to clocking troubleshooting
Flashing does not work or the problem is not clearly defined
Go to Flashing troubleshooting
Go to General power troubleshooting
Go to Memory troubleshooting
Charging does not work
Go to Charging troubleshooting
Go to Battery Current measuring troubleshooting
Display backlight does not work.
Go to Display backlight troubleshooting
Display does not work.
Go to Display troubleshooting
EL does not work.
Go to EL troubleshooting
HW-keys do not work
Go to HW-keys troubleshooting
Phone does not read microSD.
Go to microSD troubleshooting
USB does not work
Go to USB troubleshooting
Audio(Mic, Speaker or IHF) does not work.
Audio troubleshooting
Bluetooth does not work
Go to BT troubleshooting
WLAN does not work
Go to WLAN troubleshooting

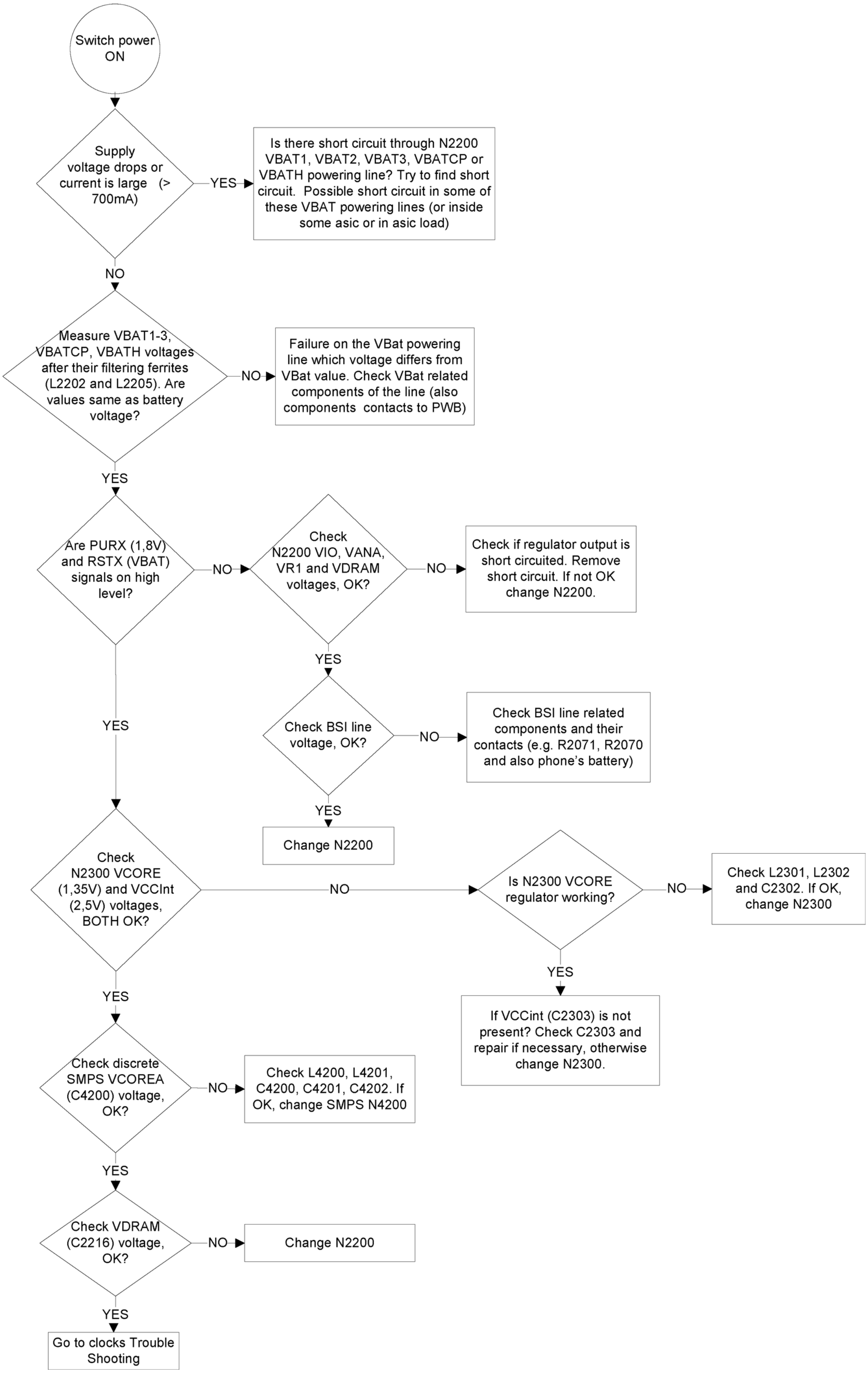
Dead or jammed device troubleshooting

Troubleshooting flow


Phone is dead or jammed
Press phone's power key -> Is phone's current consumption = 0
YES
Check VBat voltage and contacts in VBat line (e.g. battery connector)
Is there open circuit somewhere?
YES
Repair the open circuit
NO
Go to power key Trouble Shooting
NO
Is phone's current consumption large (> 700mA)
YES
Is some component very hot ?
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
GO to general power Trouble Shooting
NO
Phoenix Connection works ?
YES
Run BB-selftests and other necessary Phoenix tests (e.g. display test)
Are all those Phoenix tests OK?
NO
Check the fails -> Go to relevant part of this manual
YES
Is phone's flashing working?
NO
Go to flashing Trouble shooting
YES
Is phone still dead?
NO
Phone is working
YES
NO
Go to general power Trouble Shooting

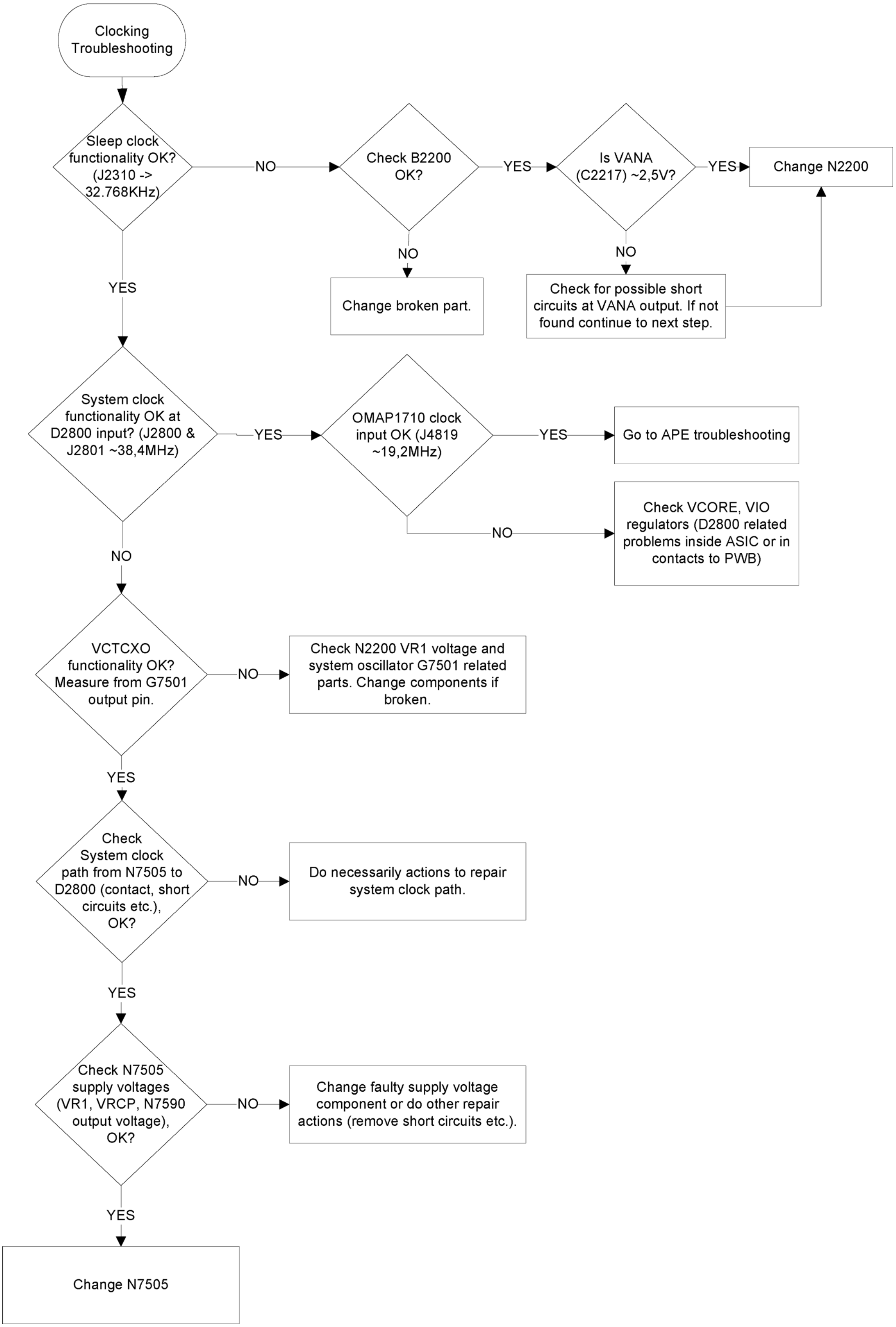
General power checking troubleshooting

Troubleshooting flow


Switch power ON
Supply voltage drops or current is large (> 700mA)
YES
Is there short circuit through N2200 VBAT1, VBAT2, VBAT3, VBATCP or VBATH powering line? Try to find short circuit. Possible short circuit in some of these VBAT powering lines (or inside some asic or in asic load)
NO
Measure VBAT1-3, VBATCP, VBATH voltages after their filtering ferrites (L2202 and L2205). Are values same as battery voltage?
NO
Failure on the VBat powering line which voltage differs from VBat value. Check VBat related components of the line (also components contacts to PWB)
YES
Are PURX (1,8V) and RSTX (VBAT) signals on high level?
NO
Check N2200 VIO, VANA, VR1 and VDRAM voltages, OK?
NO
Check if regulator output is short circuited. Remove short circuit. If not OK change N2200.
YES
Check BSI line voltage, OK?
NO
Check BSI line related components and their contacts (e.g. R2071, R2070 and also phone's battery)
YES
Change N2200
YES
Check N2300 VCORE (1,35V) and VCCInt (2,5V) voltages, BOTH OK?
NO
Is N2300 VCORE regulator working?
NO
Check L2301, L2302 and C2302. If OK, change N2300
YES
If VCCint (C2303) is not present? Check C2303 and repair if necessary, otherwise change N2300.
YES
Check discrete SMPS VCOREA (C4200) voltage, OK?
NO
Check L4200, L4201, C4200, C4201, C4202. If OK, change SMPS N4200
YES
Check VDRAM (C2216) voltage, OK?
NO
Change N2200
YES
Go to clocks Trouble Shooting

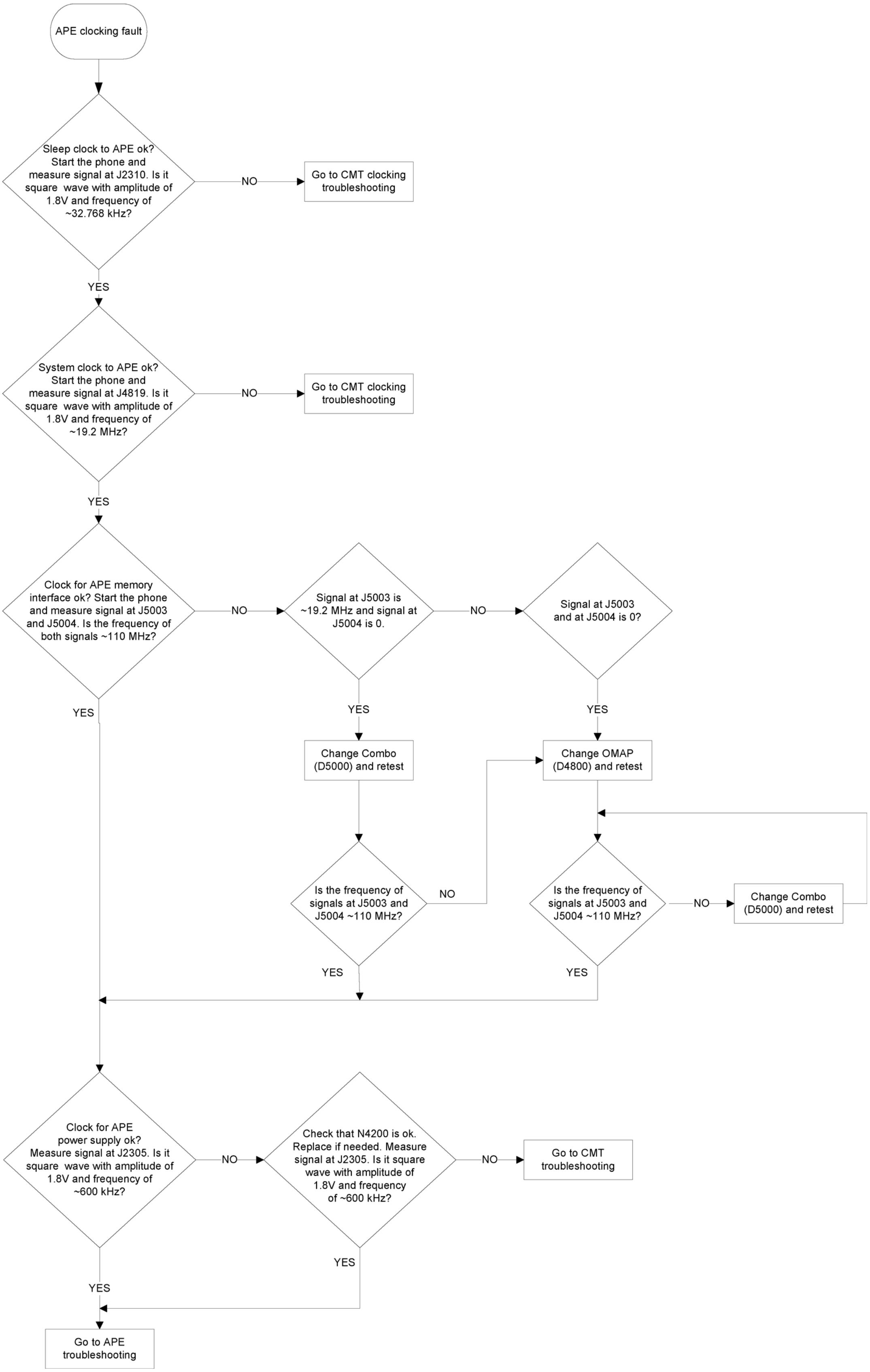
CMT clocking troubleshooting

Troubleshooting flow


Clocking Troubleshooting
Sleep clock functionality OK? (J2310 -> 32.768KHz)
NO
Check B2200 OK?
YES
Is VANA (C2217) ~2,5V?
YES
Change N2200
NO
Change broken part.
NO
Check for possible short circuits at VANA output. If not found continue to next step.
YES
System clock functionality OK at D2800 input? (J2800 & J2801 ~38,4MHz)
YES
OMAP1710 clock input OK (J4819 ~19,2MHz)
YES
Go to APE troubleshooting
NO
Check VCORE, VIO regulators (D2800 related problems inside ASIC or in contacts to PWB)
NO
VCTCXO functionality OK? Measure from G7501 output pin.
NO
Check N2200 VR1 voltage and system oscillator G7501 related parts. Change components if broken.
YES
Check System clock path from N7505 to D2800 (contact, short circuits etc.), OK?
NO
Do necessarily actions to repair system clock path.
YES
Check N7505 supply voltages (VR1, VRCP, N7590 output voltage), OK?
NO
Change faulty supply voltage component or do other repair actions (remove short circuits etc.).
YES
Change N7505

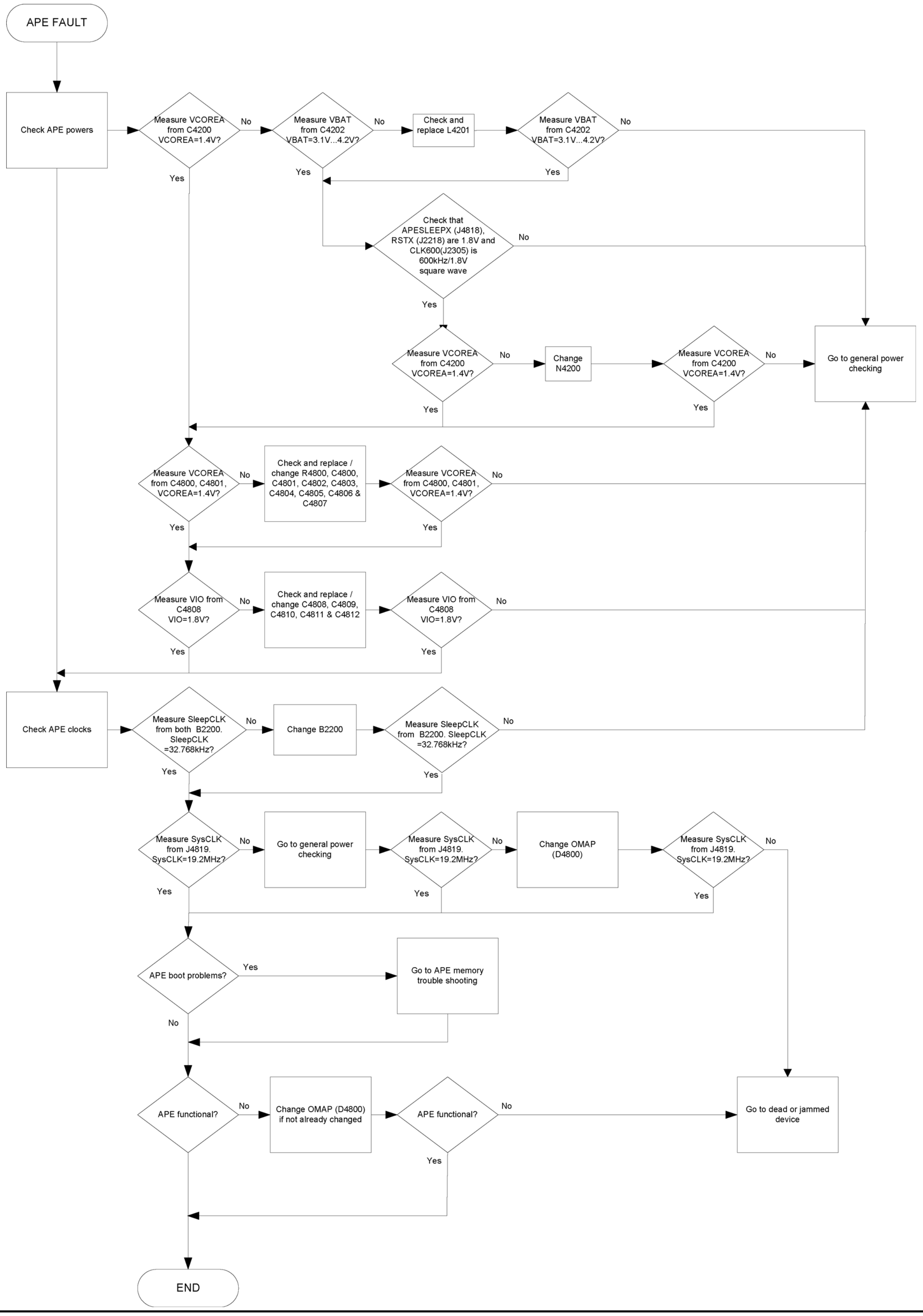
APE clocking troubleshooting

Troubleshooting flow


APE clocking fault
Sleep clock to APE ok? Start the phone and measure signal at J2310. Is it square wave with amplitude of 1.8V and frequency of ~32.768 kHz?
NO
Go to CMT clocking troubleshooting
YES
System clock to APE ok? Start the phone and measure signal at J4819. Is it square wave with amplitude of 1.8V and frequency of ~19.2 MHz?
NO
Go to CMT clocking troubleshooting
YES
Clock for APE memory interface ok? Start the phone and measure signal at J5003 and J5004. Is the frequency of both signals ~110 MHz?
NO
Signal at J5003 is ~19.2 MHz and signal at J5004 is 0.
NO
Signal at J5003 and at J5004 is 0?
YES
YES
YES
Change Combo (D5000) and retest
Change OMAP (D4800) and retest
Is the frequency of signals at J5003 and J5004 ~110 MHz?
NO
Is the frequency of signals at J5003 and J5004 ~110 MHz?
NO
Change Combo (D5000) and retest
YES
YES
Clock for APE power supply ok? Measure signal at J2305. Is it square wave with amplitude of 1.8V and frequency of ~600 kHz?
NO
Check that N4200 is ok. Replace if needed. Measure signal at J2305. Is it square wave with amplitude of 1.8V and frequency of ~600 kHz?
NO
Go to CMT troubleshooting
YES
YES
Go to APE troubleshooting

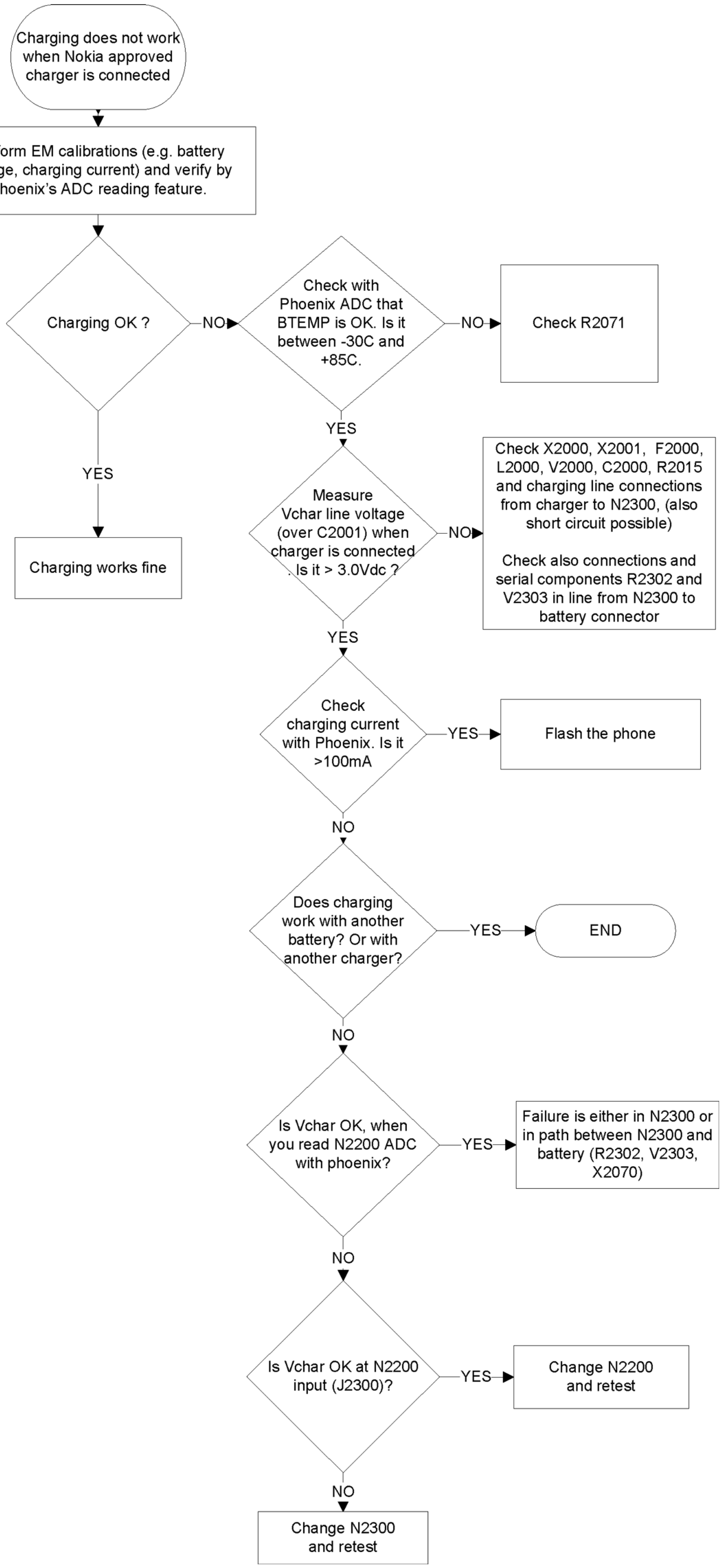
APE troubleshooting

Troubleshooting flow


APE FAULT
Check APE powers
Measure VCOREA from C4200 VCOREA=1.4V?
No
Yes
Measure VBAT from C4202 VBAT=3.1V...4.2V?
No
Yes
Check and replace L4201
Measure VBAT from C4202 VBAT=3.1V...4.2V?
No
Yes
Check that APESLEEPX (J4818), RSTX (J2218) are 1.8V and CLK600(J2305) is 600kHz/1.8V square wave
No
Yes
Measure VCOREA from C4200 VCOREA=1.4V?
No
Yes
Change N4200
Measure VCOREA from C4200 VCOREA=1.4V?
No
Yes
Go to general power checking
Measure VCOREA from C4800, C4801, VCOREA=1.4V?
No
Yes
Check and replace / change R4800, C4800, C4801, C4802, C4803, C4804, C4805, C4806 & C4807
Measure VCOREA from C4800, C4801, VCOREA=1.4V?
No
Yes
Measure VIO from C4808 VIO=1.8V?
No
Yes
Check and replace / change C4808, C4809, C4810, C4811 & C4812
Measure VIO from C4808 VIO=1.8V?
No
Yes
Check APE clocks
Measure SleepCLK from both B2200. SleepCLK =32.768kHz?
No
Yes
Change B2200
Measure SleepCLK from B2200. SleepCLK =32.768kHz?
No
Yes
Measure SysCLK from J4819. SysCLK=19.2MHz?
No
Yes
Go to general power checking
Measure SysCLK from J4819. SysCLK=19.2MHz?
No
Yes
Change OMAP (D4800)
Measure SysCLK from J4819. SysCLK=19.2MHz?
No
Yes
APE boot problems?
Yes
No
Go to APE memory trouble shooting
APE functional?
No
Change OMAP (D4800) if not already changed
APE functional?
No
Yes
Go to dead or jammed device
END

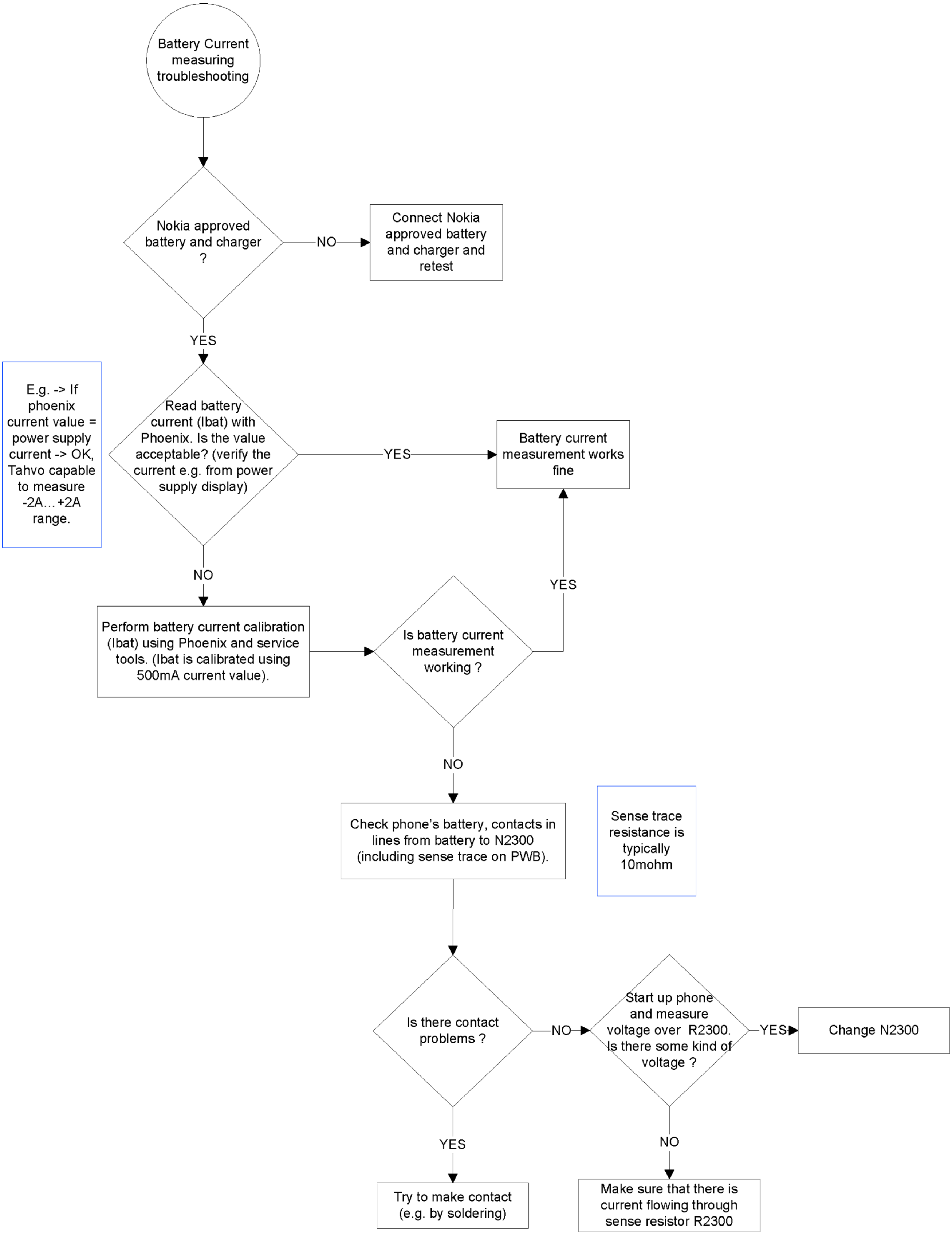
Charging troubleshooting

Troubleshooting flow


Charging does not work when Nokia approved charger is connected
Perform EM calibrations (e.g. battery voltage, charging current) and verify by Phoenix's ADC reading feature.
Charging OK ?
NO
Check with Phoenix ADC that BTEMP is OK. Is it between -30C and +85C.
NO
Check R2071
YES
Charging works fine
YES
Measure Vchar line voltage (over C2001) when charger is connected . Is it > 3.0Vdc ?
NO
Check X2000, X2001, F2000, L2000, V2000, C2000, R2015 and charging line connections from charger to N2300, (also short circuit possible)
Check also connections and serial components R2302 and V2303 in line from N2300 to battery connector
YES
Check charging current with Phoenix. Is it >100mA
YES
Flash the phone
NO
Does charging work with another battery? Or with another charger?
YES
END
NO
Is Vchar OK, when you read N2200 ADC with phoenix?
YES
Failure is either in N2300 or in path between N2300 and battery (R2302, V2303, X2070)
NO
Is Vchar OK at N2200 input (J2300)?
YES
Change N2200 and retest
NO
Change N2300 and retest

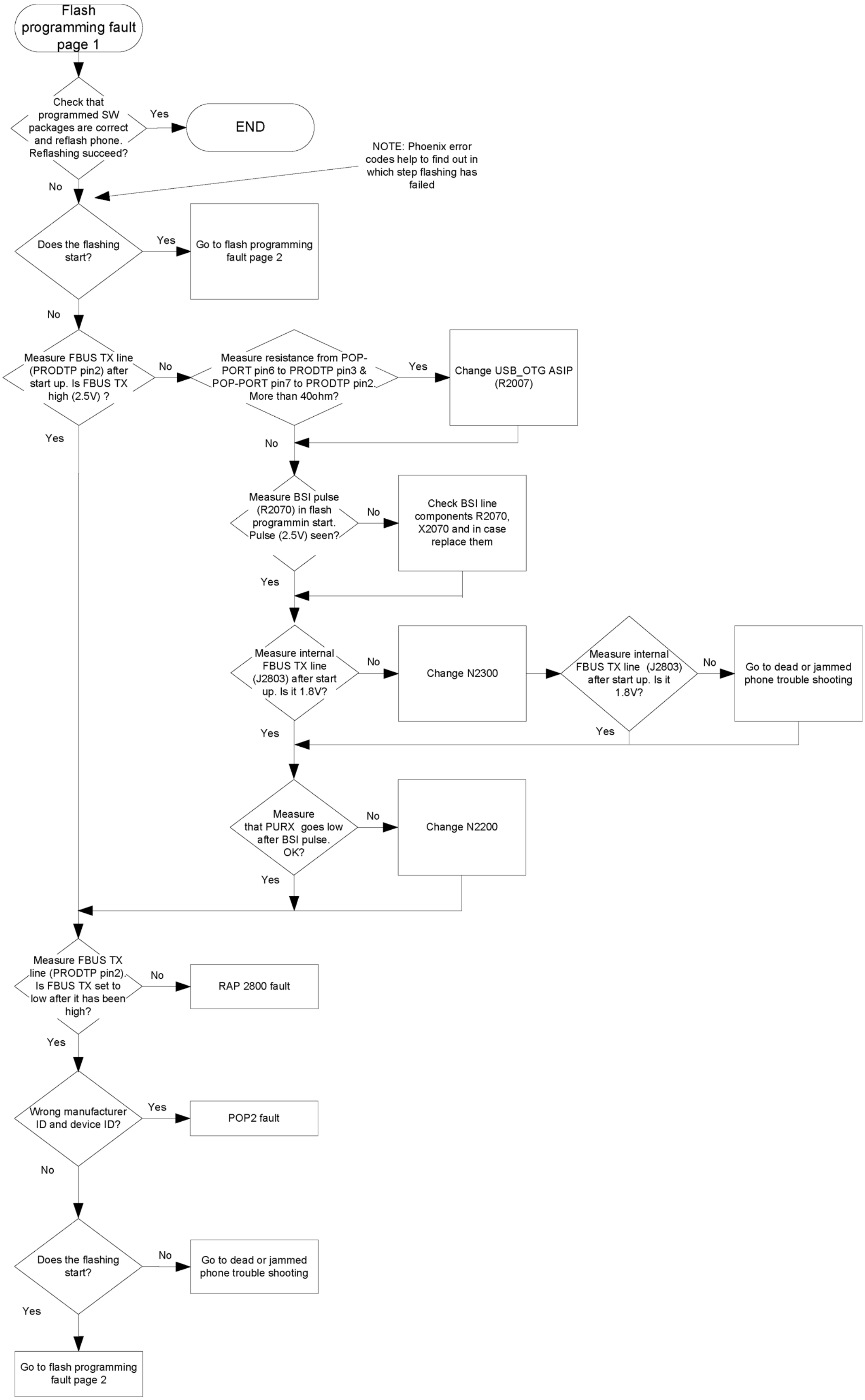
Battery current measuring fault troubleshooting

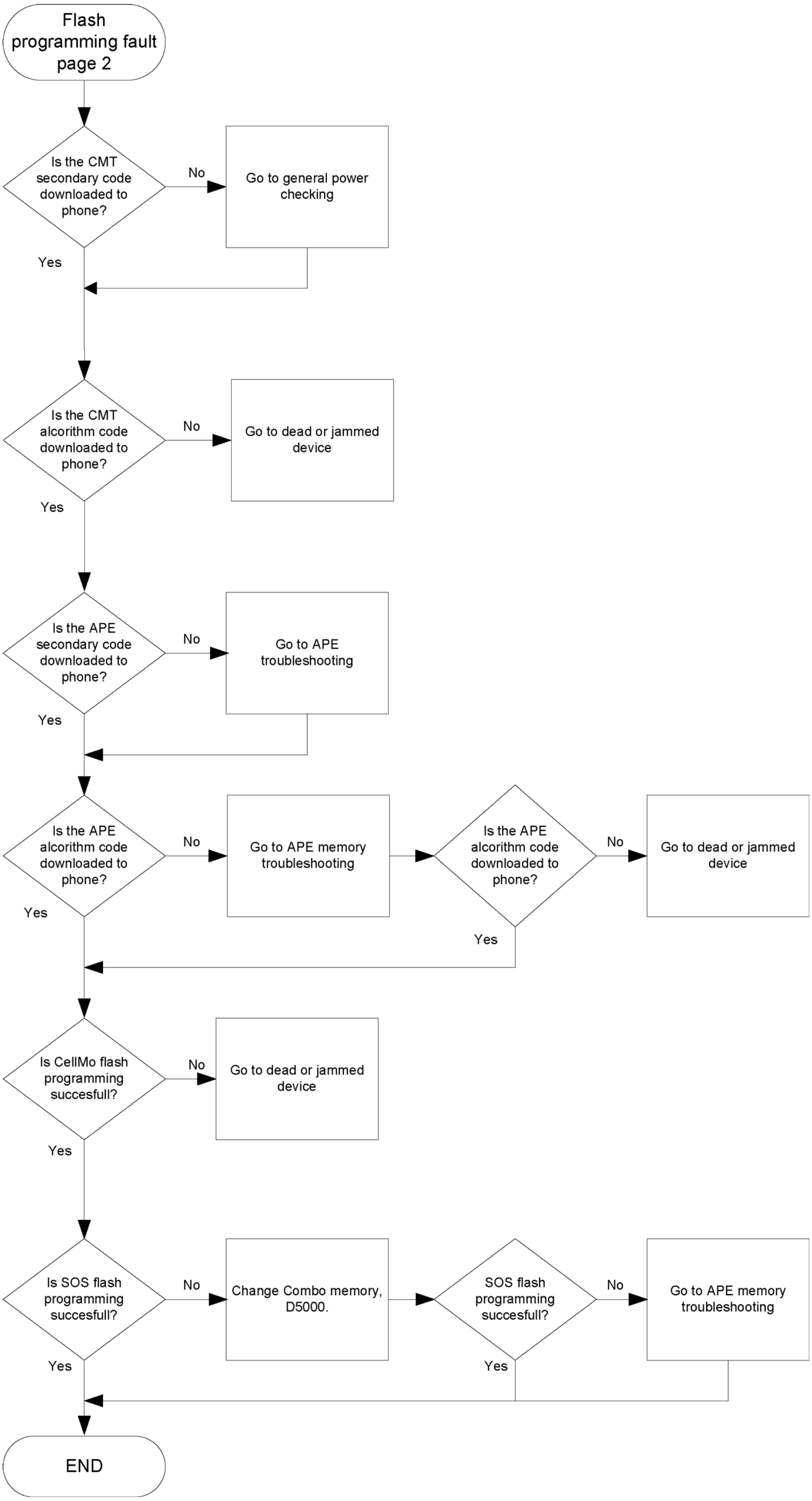
Troubleshooting flow


Battery Current measuring troubleshooting
Nokia approved battery and charger ?
NO
Connect Nokia approved battery and charger and retest
YES
E.g. -> If phoenix current value = power supply current -> OK, Tahvo capable to measure -2A…+2A range.
Read battery current (Ibat) with Phoenix. Is the value acceptable? (verify the current e.g. from power supply display)
YES
Battery current measurement works fine
NO
Perform battery current calibration (Ibat) using Phoenix and service tools. (Ibat is calibrated using 500mA current value).
Is battery current measurement working ?
YES
NO
Check phone's battery, contacts in lines from battery to N2300 (including sense trace on PWB).
Sense trace resistance is typically 10mohm
Is there contact problems ?
NO
Start up phone and measure voltage over R2300. Is there some kind of voltage ?
YES
Change N2300
YES
Try to make contact (e.g. by soldering)
NO
Make sure that there is current flowing through sense resistor R2300

Flash programming fault troubleshooting

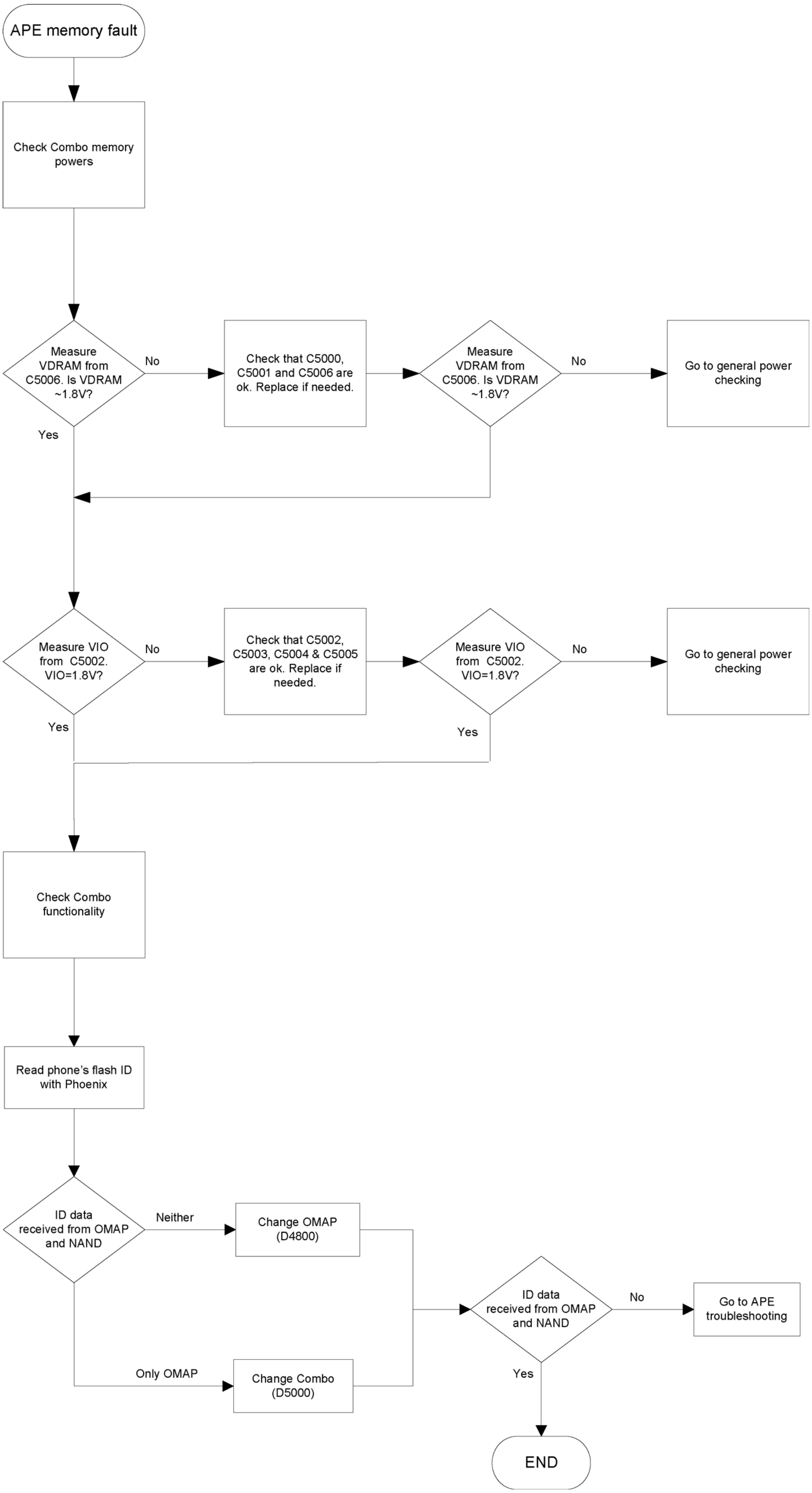
Troubleshooting flow


Flash programming fault page 1
Check that programmed SW packages are correct and reflash phone. Reflashing succeed?
Yes
END
NOTE: Phoenix error codes help to find out in which step flashing has failed
No
Does the flashing start?
Yes
Go to flash programming fault page 2
No
Measure FBUS TX line (PRODTP pin2) after start up. Is FBUS TX high (2.5V) ?
No
Measure resistance from POP-PORT pin6 to PRODTP pin3 & POP-PORT pin7 to PRODTP pin2. More than 40ohm?
Yes
Change USB_OTG ASIP (R2007)
No
Yes
Measure BSI pulse (R2070) in flash programmin start. Pulse (2.5V) seen?
No
Check BSI line components R2070, X2070 and in case replace them
Yes
Measure internal FBUS TX line (J2803) after start up. Is it 1.8V?
No
Change N2300
Measure internal FBUS TX line (J2803) after start up. Is it 1.8V?
No
Go to dead or jammed phone trouble shooting
Yes
Yes
Measure that PURX goes low after BSI pulse. OK?
No
Change N2200
Yes
Measure FBUS TX line (PRODTP pin2). Is FBUS TX set to low after it has been high?
No
RAP 2800 fault
Yes
Wrong manufacturer ID and device ID?
Yes
POP2 fault
No
Does the flashing start?
No
Go to dead or jammed phone trouble shooting
Yes
Go to flash programming fault page 2


Flash programming fault page 2
Is the CMT secondary code downloaded to phone?
No
Go to general power checking
Yes
Is the CMT alcorithm code downloaded to phone?
No
Go to dead or jammed device
Yes
Is the APE secondary code downloaded to phone?
No
Go to APE troubleshooting
Yes
Is the APE alcorithm code downloaded to phone?
No
Go to APE memory troubleshooting
Is the APE alcorithm code downloaded to phone?
No
Go to dead or jammed device
Yes
Yes
Is CellMo flash programming succesfull?
No
Go to dead or jammed device
Yes
Is SOS flash programming succesfull?
No
Change Combo memory, D5000.
SOS flash programming succesfull?
No
Go to APE memory troubleshooting
Yes
Yes
END

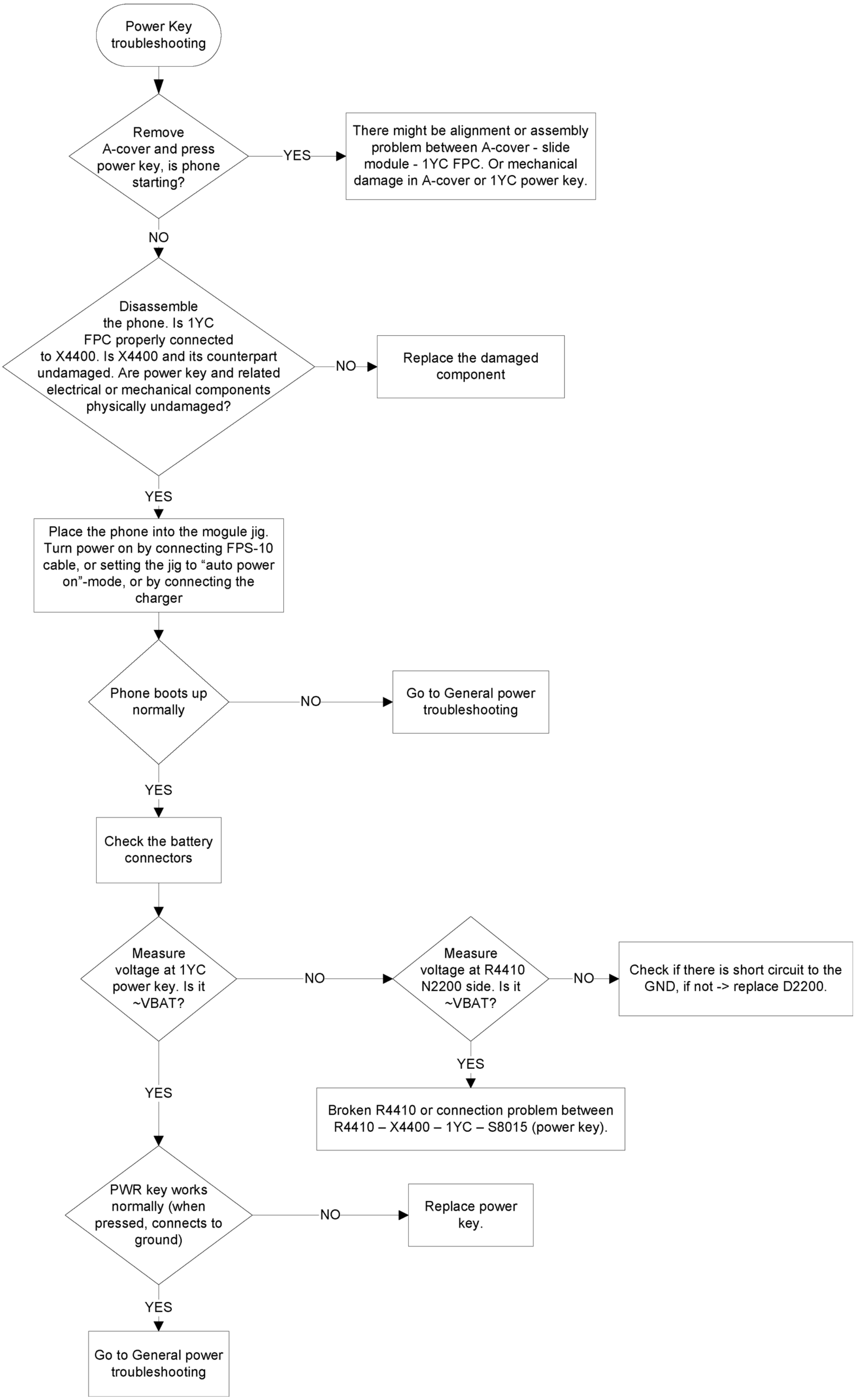
APE memory troubleshooting

Troubleshooting flow


APE memory fault
Check Combo memory powers
Measure VDRAM from C5006. Is VDRAM ~1.8V?
No
Check that C5000, C5001 and C5006 are ok. Replace if needed.
Measure VDRAM from C5006. Is VDRAM ~1.8V?
No
Go to general power checking
Yes
Measure VIO from C5002. VIO=1.8V?
No
Check that C5002, C5003, C5004 & C5005 are ok. Replace if needed.
Measure VIO from C5002. VIO=1.8V?
No
Go to general power checking
Yes
Yes
Check Combo functionality
Read phone's flash ID with Phoenix
ID data received from OMAP and NAND
Neither
Change OMAP (D4800)
Only OMAP
Change Combo (D5000)
ID data received from OMAP and NAND
No
Go to APE troubleshooting
Yes
END

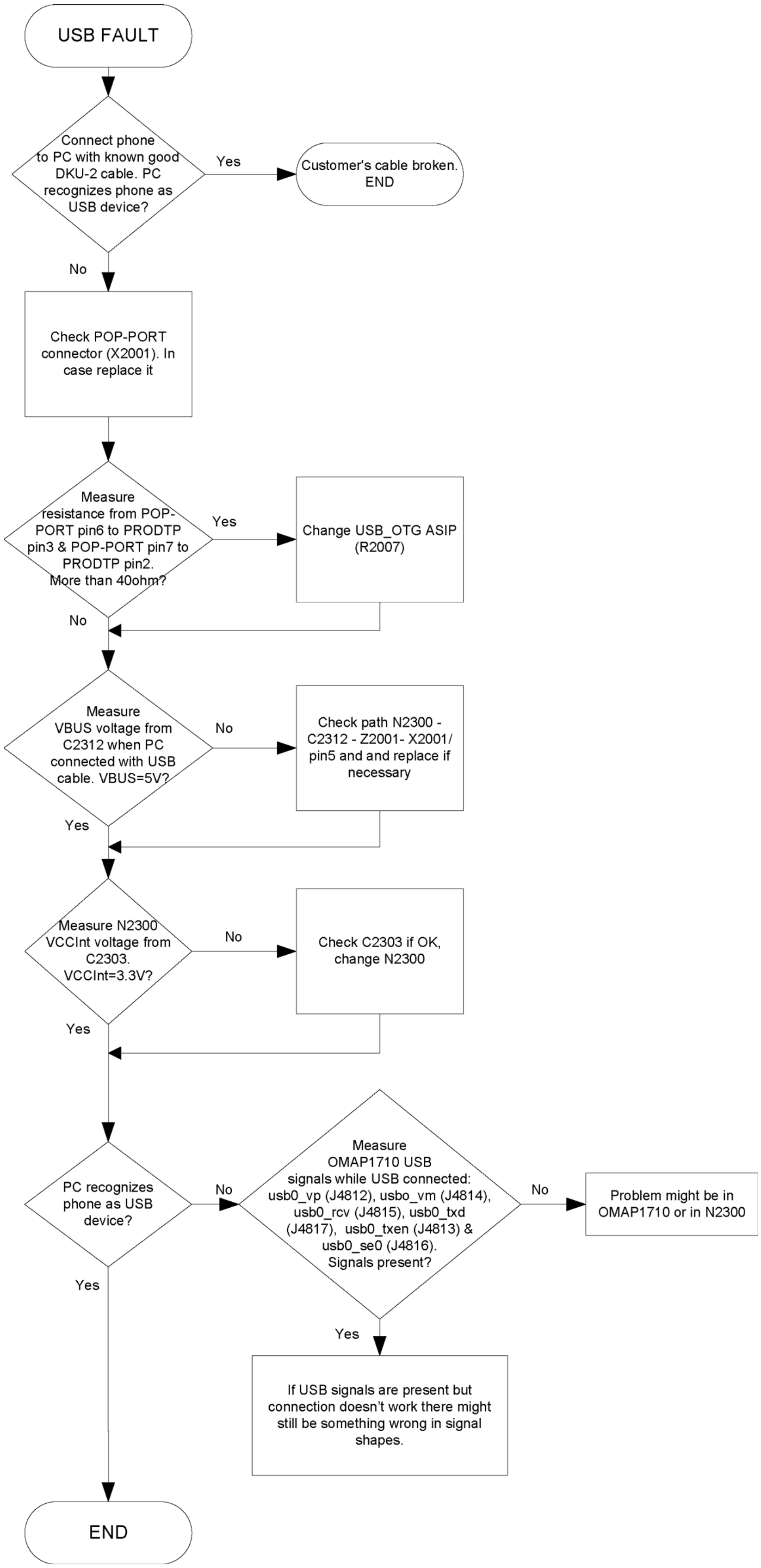
Power key troubleshooting

Troubleshooting flow


Power Key troubleshooting
Remove A-cover and press power key, is phone starting?
YES
There might be alignment or assembly problem between A-cover - slide module - 1YC FPC. Or mechanical damage in A-cover or 1YC power key.
NO
Disassemble the phone. Is 1YC FPC properly connected to X4400. Is X4400 and its counterpart undamaged. Are power key and related electrical or mechanical components physically undamaged?
NO
Replace the damaged component
YES
Place the phone into the mogule jig. Turn power on by connecting FPS-10 cable, or setting the jig to "auto power on"-mode, or by connecting the charger
Phone boots up normally
NO
Go to General power troubleshooting
YES
Check the battery connectors
Measure voltage at 1YC power key. Is it ~VBAT?
NO
Measure voltage at R4410 N2200 side. Is it ~VBAT?
NO
Check if there is short circuit to the GND, if not -> replace D2200.
YES
Broken R4410 or connection problem between R4410 – X4400 – 1YC – S8015 (power key).
YES
PWR key works normally (when pressed, connects to ground)
NO
Replace power key.
YES
Go to General power troubleshooting

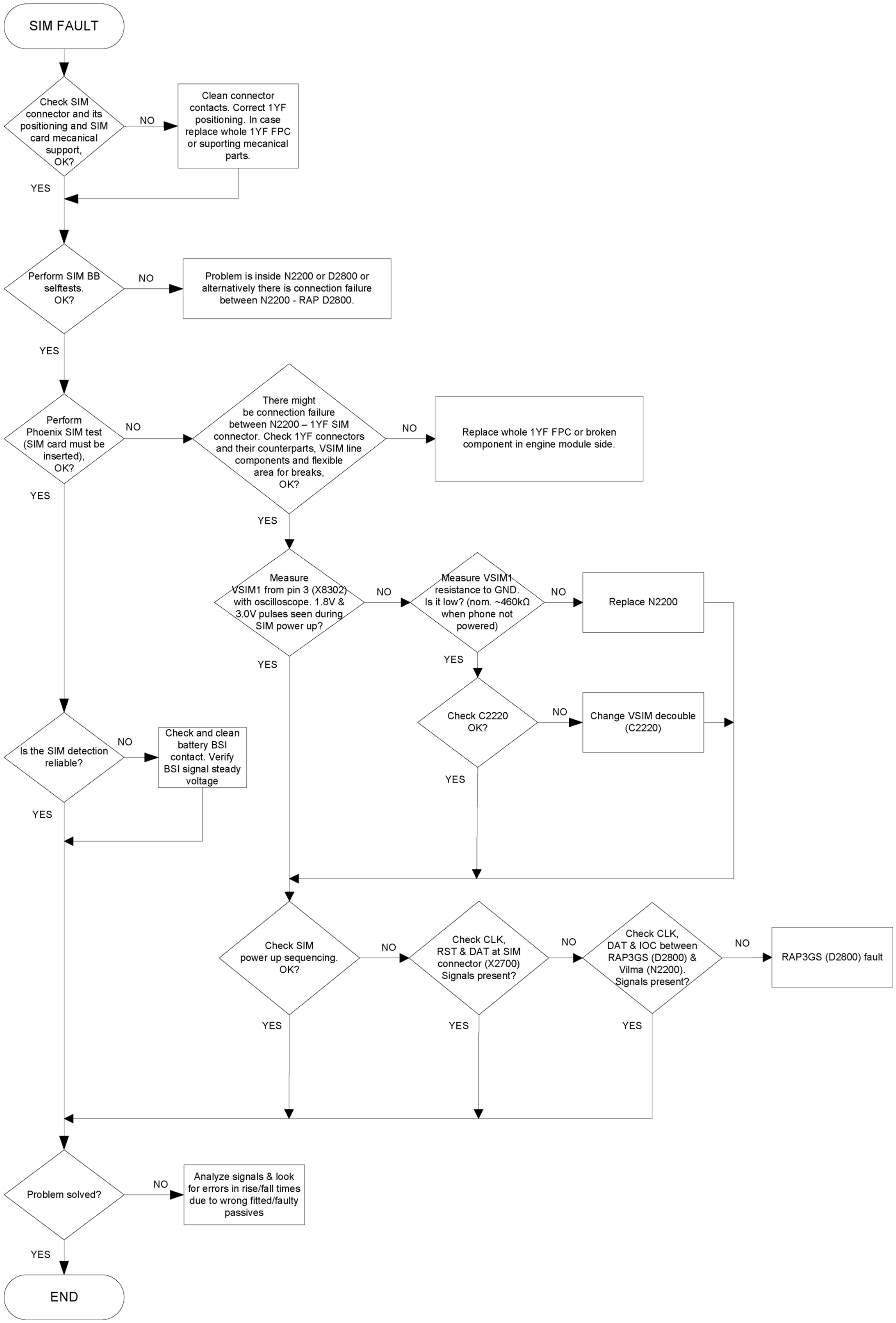
USB interface troubleshooting

Troubleshooting flow


USB FAULT
Connect phone to PC with known good DKU-2 cable. PC recognizes phone as USB device?
Yes
Customer's cable broken. END
No
Check POP-PORT connector (X2001). In case replace it
Measure resistance from POP-PORT pin6 to PRODTP pin3 & POP-PORT pin7 to PRODTP pin2. More than 40ohm?
Yes
Change USB_OTG ASIP (R2007)
No
Measure VBUS voltage from C2312 when PC connected with USB cable. VBUS=5V?
No
Check path N2300 - C2312 - Z2001- X2001/ pin5 and and replace if necessary
Yes
Measure N2300 VCCInt voltage from C2303. VCCInt=3.3V?
No
Check C2303 if OK, change N2300
Yes
PC recognizes phone as USB device?
No
Measure OMAP1710 USB signals while USB connected: usb0_vp (J4812), usbo_vm (J4814), usb0_rcv (J4815), usb0_txd (J4817), usb0_txen (J4813) & usb0_se0 (J4816). Signals present?
No
Problem might be in OMAP1710 or in N2300
Yes
If USB signals are present but connection doesn't work there might still be something wrong in signal shapes.
Yes
END

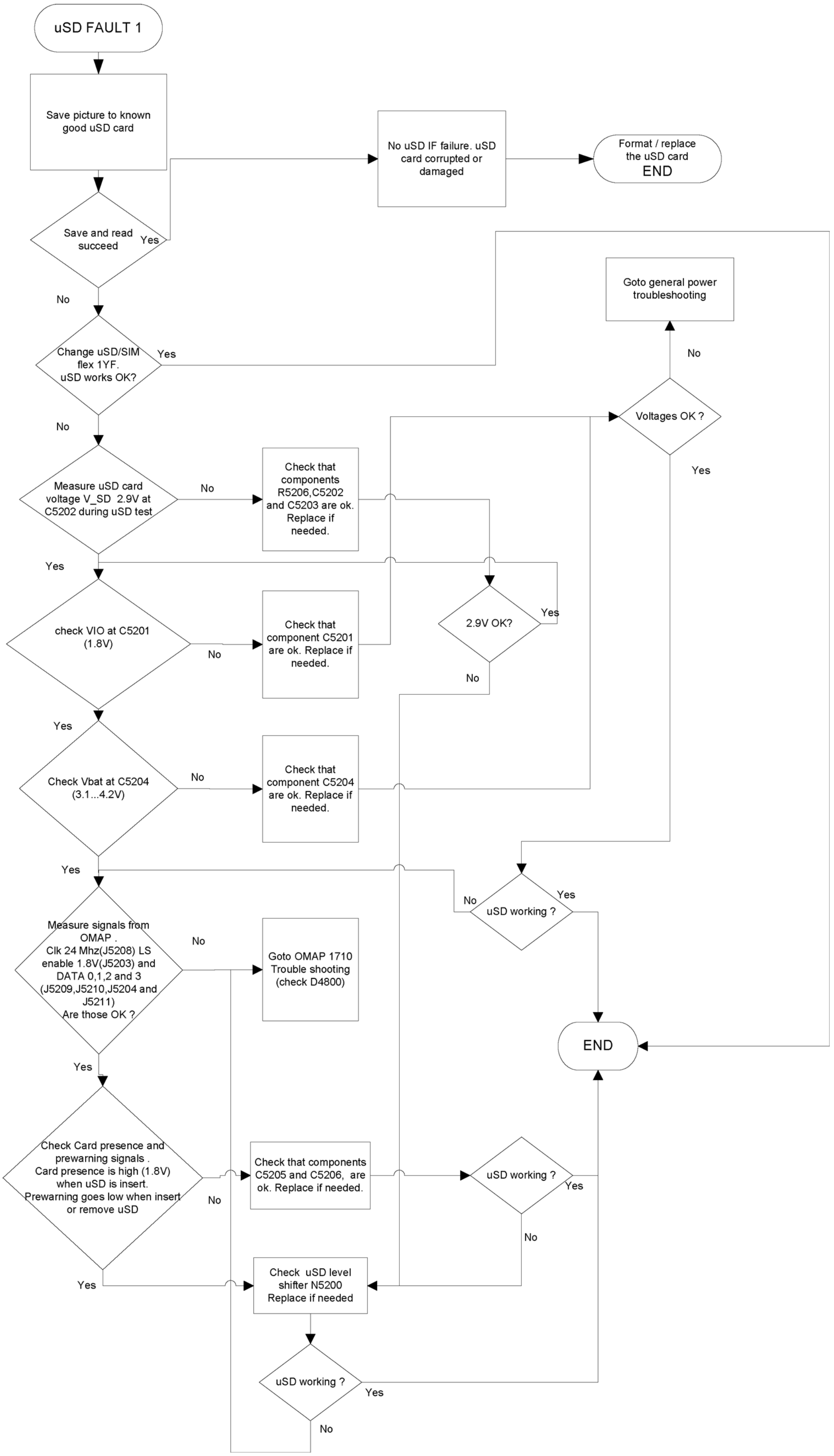
SIM card troubleshooting

Troubleshooting flow


SIM FAULT
Check SIM connector and its positioning and SIM card mecanical support, OK?
NO
Clean connector contacts. Correct 1YF positioning. In case replace whole 1YF FPC or suporting mecanical parts.
YES
Perform SIM BB selftests. OK?
NO
Problem is inside N2200 or D2800 or alternatively there is connection failure between N2200 - RAP D2800.
YES
Perform Phoenix SIM test (SIM card must be inserted), OK?
NO
There might be connection failure between N2200 – 1YF SIM connector. Check 1YF connectors and their counterparts, VSIM line components and flexible area for breaks, OK?
NO
Replace whole 1YF FPC or broken component in engine module side.
YES
YES
Measure VSIM1 from pin 3 (X8302) with oscilloscope. 1.8V & 3.0V pulses seen during SIM power up?
NO
Measure VSIM1 resistance to GND. Is it low? (nom. ~460kΩ when phone not powered)
NO
Replace N2200
YES
YES
Check C2220 OK?
NO
Change VSIM decouble (C2220)
YES
Is the SIM detection reliable?
NO
Check and clean battery BSI contact. Verify BSI signal steady voltage
YES
Check SIM power up sequencing. OK?
NO
Check CLK, RST & DAT at SIM connector (X2700) Signals present?
NO
Check CLK, DAT & IOC between RAP3GS (D2800) & Vilma (N2200). Signals present?
NO
RAP3GS (D2800) fault
YES
YES
YES
Problem solved?
NO
Analyze signals & look for errors in rise/fall times due to wrong fitted/faulty passives
YES
END

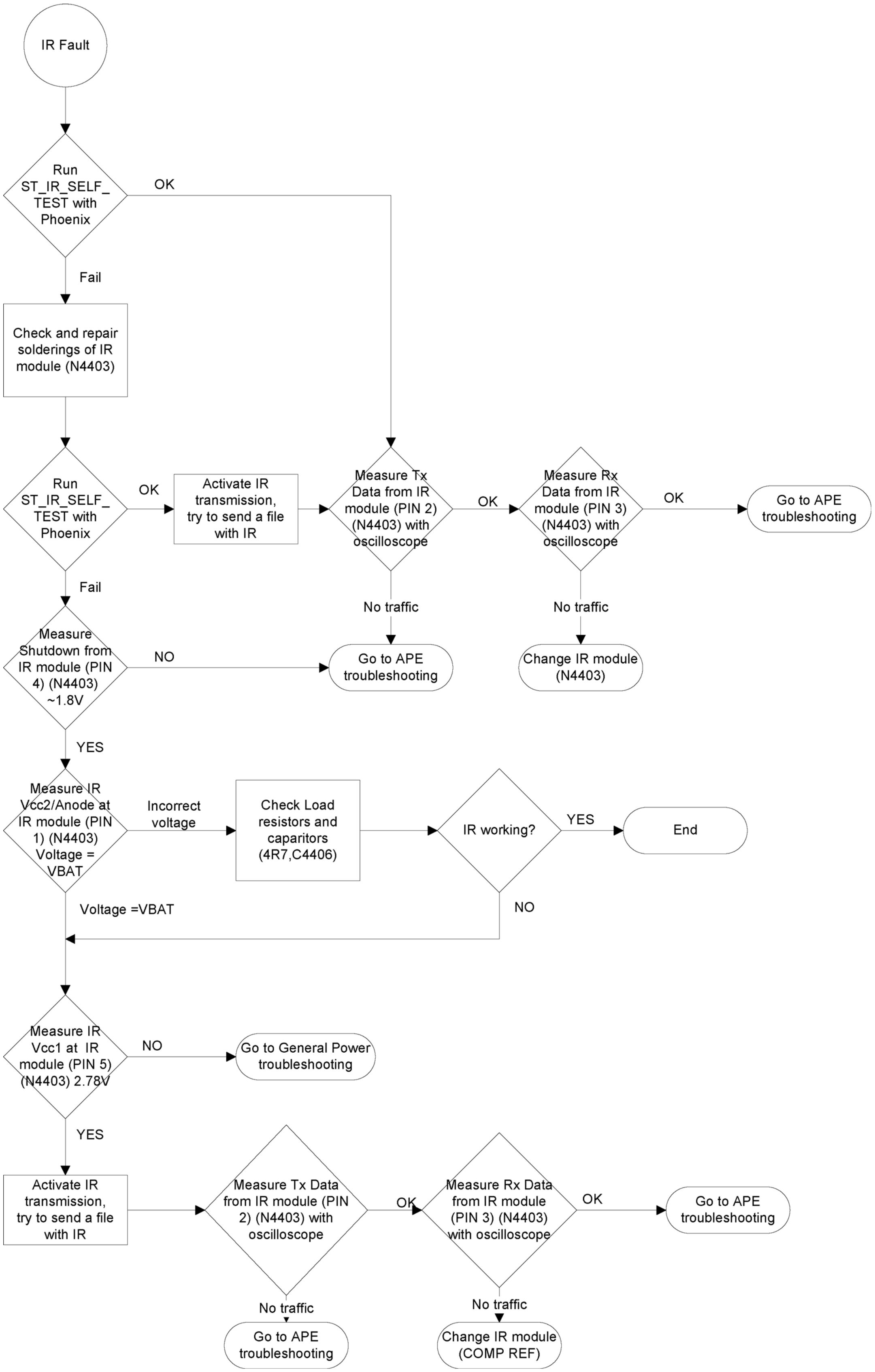
MicroSD card troubleshooting

Troubleshooting flow


uSD FAULT 1
Save picture to known good uSD card
No uSD IF failure. uSD card corrupted or damaged
Format / replace the uSD card END
Save and read succeed
Yes
No
Change uSD/SIM flex 1YF. uSD works OK?
Yes
Goto general power troubleshooting
No
Voltages OK ?
Yes
No
Measure uSD card voltage V_SD 2.9V at C5202 during uSD test
No
Check that components R5206,C5202 and C5203 are ok. Replace if needed.
Yes
check VIO at C5201 (1.8V)
No
Check that component C5201 are ok. Replace if needed.
2.9V OK?
Yes
No
Yes
Check Vbat at C5204 (3.1...4.2V)
No
Check that component C5204 are ok. Replace if needed.
Yes
No
uSD working ?
Yes
Measure signals from OMAP . Clk 24 Mhz(J5208) LS enable 1.8V(J5203) and DATA 0,1,2 and 3 (J5209,J5210,J5204 and J5211) Are those OK ?
No
Goto OMAP 1710 Trouble shooting (check D4800)
END
Yes
Check Card presence and prewarning signals . Card presence is high (1.8V) when uSD is insert. Prewarning goes low when insert or remove uSD
No
Check that components C5205 and C5206, are ok. Replace if needed.
uSD working ?
Yes
No
Yes
Check uSD level shifter N5200 Replace if needed
uSD working ?
Yes
No

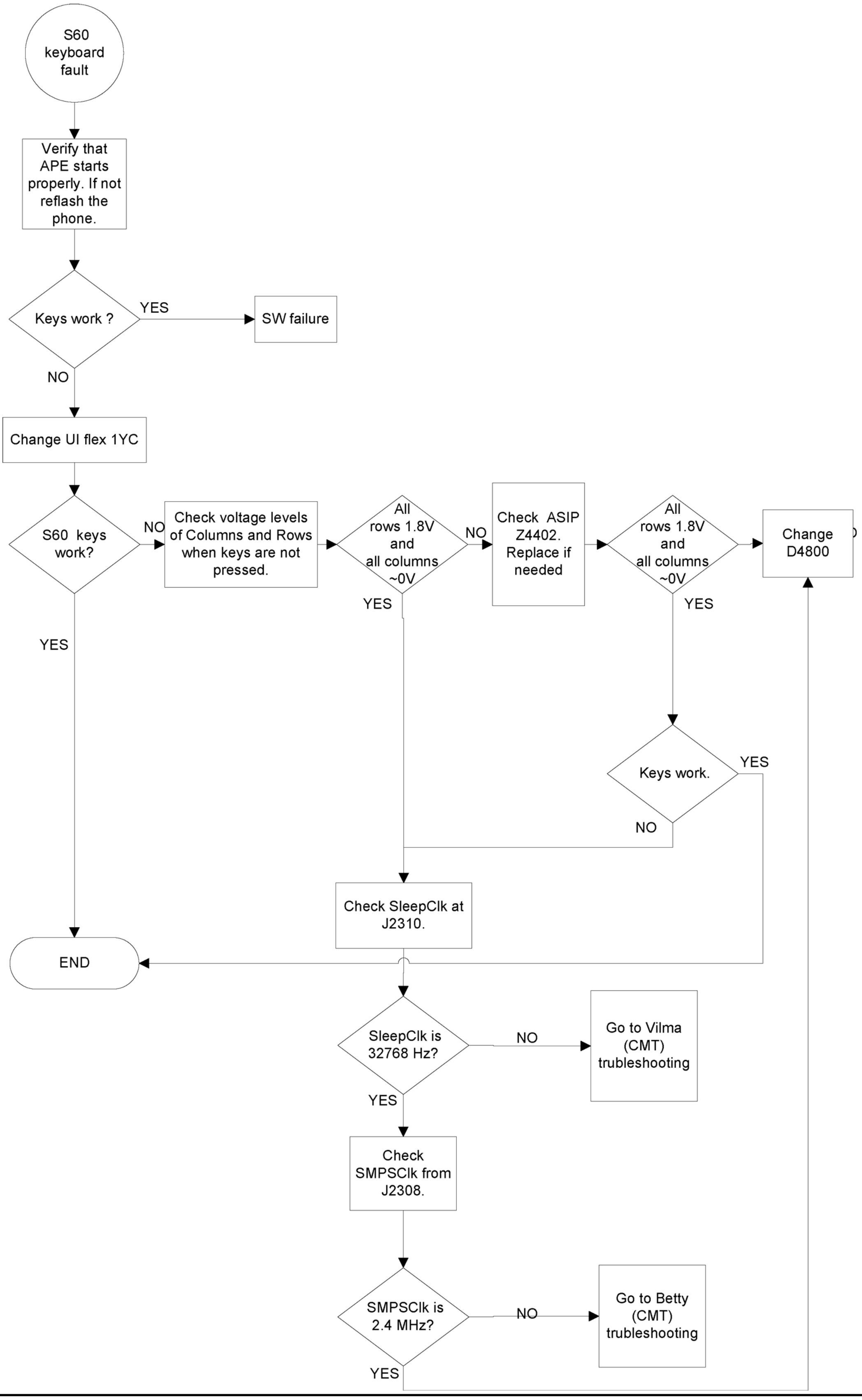
IR troubleshooting

Troubleshooting flow


IR Fault
Run ST_IR_SELF_TEST with Phoenix
OK
Fail
Check and repair solderings of IR module (N4403)
Run ST_IR_SELF_TEST with Phoenix
OK
Activate IR transmission, try to send a file with IR
Measure Tx Data from IR module (PIN 2) (N4403) with oscilloscope
OK
Measure Rx Data from IR module (PIN 3) (N4403) with oscilloscope
OK
Go to APE troubleshooting
No traffic
No traffic
Fail
Measure Shutdown from IR module (PIN 4) (N4403) ~1.8V
NO
Go to APE troubleshooting
Change IR module (N4403)
YES
Measure IR Vcc2/Anode at IR module (PIN 1) (N4403) Voltage = VBAT
Incorrect voltage
Check Load resistors and caparitors (4R7,C4406)
IR working?
YES
End
Voltage =VBAT
NO
Measure IR Vcc1 at IR module (PIN 5) (N4403) 2.78V
NO
Go to General Power troubleshooting
YES
Activate IR transmission, try to send a file with IR
Measure Tx Data from IR module (PIN 2) (N4403) with oscilloscope
OK
Measure Rx Data from IR module (PIN 3) (N4403) with oscilloscope
OK
Go to APE troubleshooting
No traffic
No traffic
Go to APE troubleshooting
Change IR module (COMP REF)

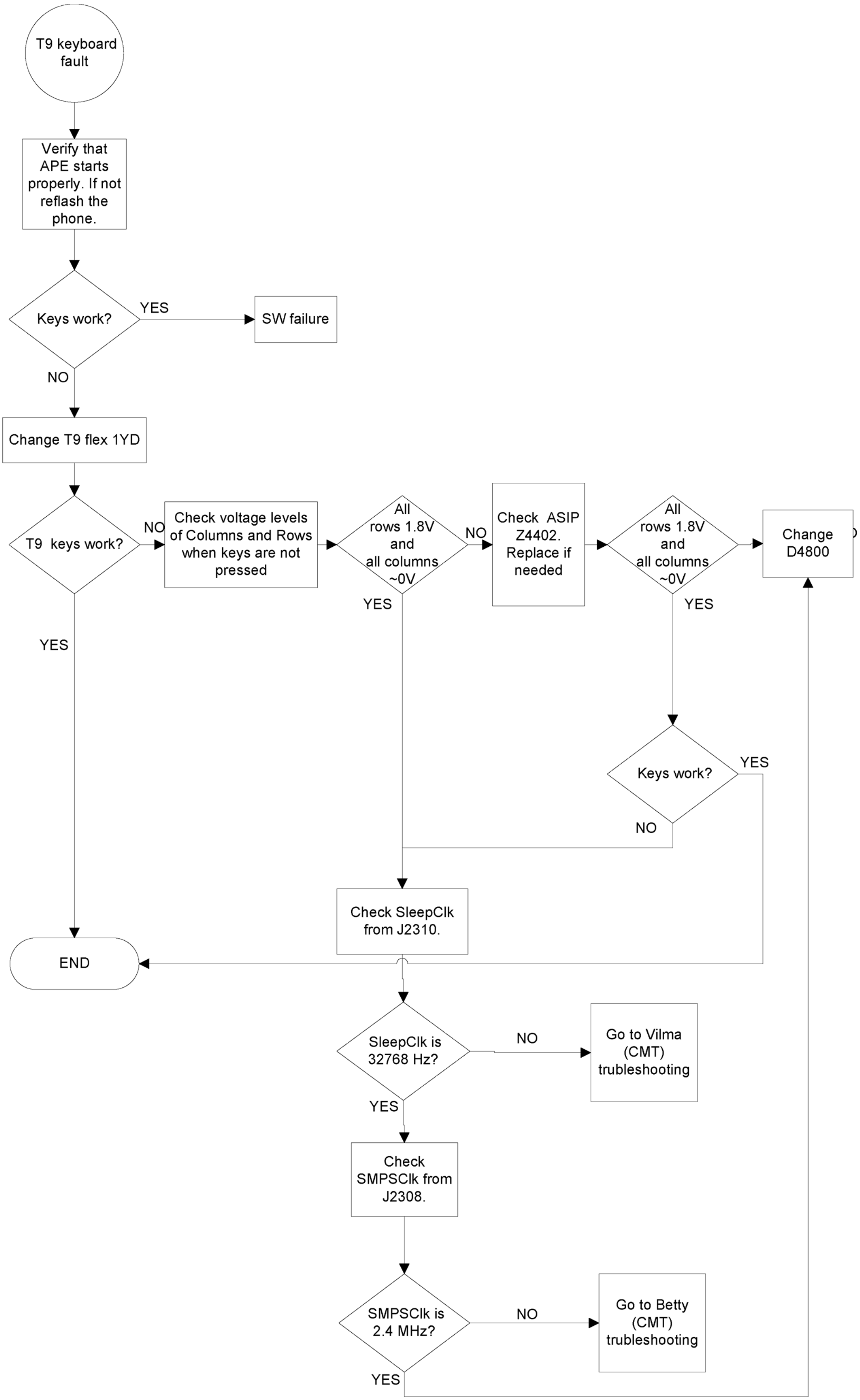
S60 keyboard troubleshooting

Troubleshooting flow


S60 keyboard fault
Verify that APE starts properly. If not reflash the phone.
Keys work ?
YES
SW failure
NO
Change UI flex 1YC
S60 keys work?
NO
Check voltage levels of Columns and Rows when keys are not pressed.
All rows 1.8V and all columns ~0V
NO
Check ASIP Z4402. Replace if needed
All rows 1.8V and all columns ~0V
Change D4800
YES
YES
YES
Keys work.
YES
NO
Check SleepClk at J2310.
END
SleepClk is 32768 Hz?
NO
Go to Vilma (CMT) trubleshooting
YES
Check SMPSClk from J2308.
SMPSClk is 2.4 MHz?
NO
Go to Betty (CMT) trubleshooting
YES

T9 keyboard troubleshooting

Troubleshooting flow


T9 keyboard fault
Verify that APE starts properly. If not reflash the phone.
Keys work?
YES
SW failure
NO
Change T9 flex 1YD
T9 keys work?
NO
Check voltage levels of Columns and Rows when keys are not pressed
All rows 1.8V and all columns ~0V
NO
YES
Check ASIP Z4402. Replace if needed
All rows 1.8V and all columns ~0V
Change D4800
YES
Keys work?
YES
NO
YES
END
Check SleepClk from J2310.
SleepClk is 32768 Hz?
NO
Go to Vilma (CMT) trubleshooting
YES
Check SMPSClk from J2308.
SMPSClk is 2.4 MHz?
NO
Go to Betty (CMT) trubleshooting
YES

Certificate restoring for BB5 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-8 or FPS-10.

  Note: USB flashing does not work for a dead BB5 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2004.39.7.70 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5 testing and tuning features)
- External smart card reader

  Note: The smart card reader is only needed when FPS-8 is used. FPS-10 has an integrated smart card reader.
- Activated FPS-8 flash prommer **OR** FPS-10 flash prommer
- Flash update package 03.18.004 or newer for FPS-8 or FPS-10 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.

   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-8 or FPS-10.

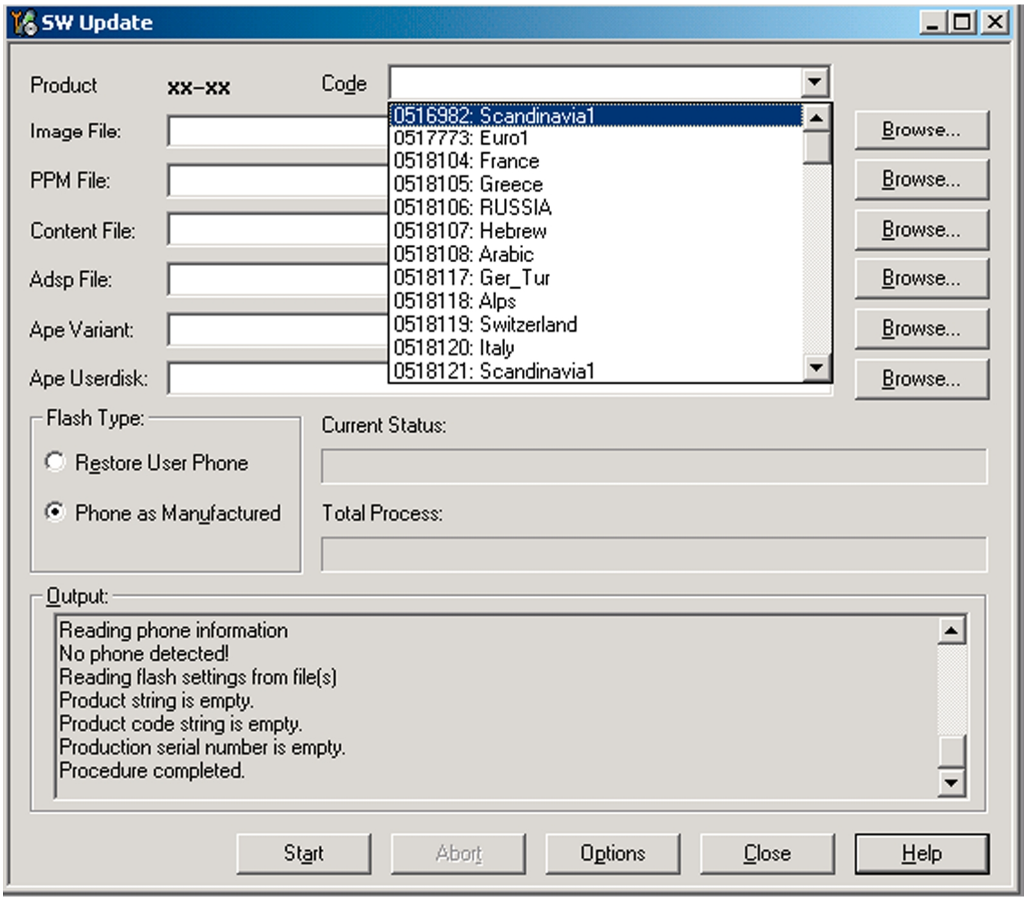
   ii Update the phone MCU software to the latest available version.

   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

iii Choose the product manually from **File→Open Product** , and click **OK**.

Wait for the phone type designator (e.g. "RM-1") to be displayed in the status bar.

iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



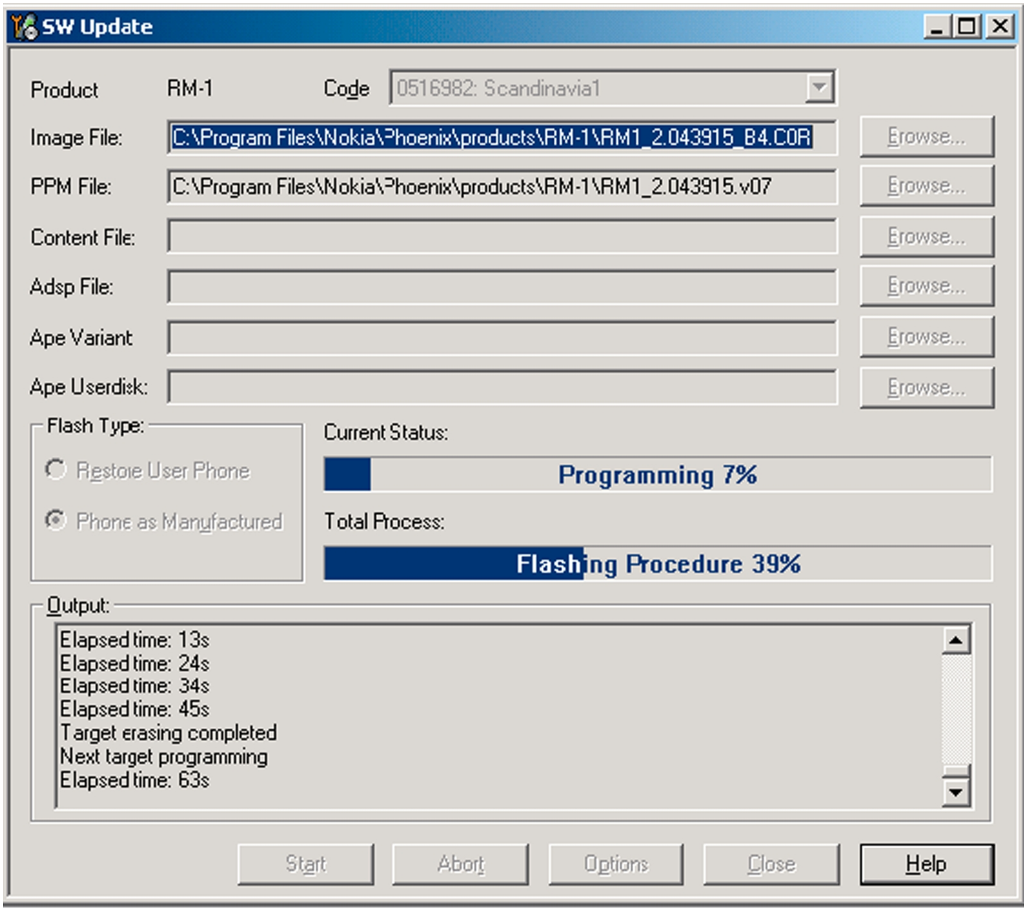
SW Update
Product
XX-XX
Code
0516982: Scandinavia1
0517773: Euro1
0518104: France
0518105: Greece
0518106: RUSSIA
0518107: Hebrew
0518108: Arabic
0518117: Ger_Tur
0518118: Alps
0518119: Switzerland
0518120: Italy
0518121: Scandinavia1
Image File:
PPM File:
Content File:
Adsp File:
Ape Variant:
Ape Userdisk:
Browse...
Flash Type:
○ Restore User Phone
● Phone as Manufactured
Current Status:
Total Process:
Output:
Start
Abort
Options
Close
Help

```
Reading phone information
No phone detected!
Reading flash settings from file(s)
Product string is empty.
Product code string is empty.
Production serial number is empty.
Procedure completed.
```

Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.


SW Update
Browse...
Browse...
Browse...
Browse...
Browse...
Browse...
Start
Abort
Options
Close
Help

Product: RM-1
Code: 0516982: Scandinavia1
Image File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915_B4.C0R
PPM File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915.v07
Content File:
Adsp File:
Ape Variant
Ape Userdisk:

Flash Type:
○ Restore User Phone
● Phone as Manufactured

Current Status: Programming 7%
Total Process: Flashing Procedure 39%

Output:

```
Elapsed time: 13s
Elapsed time: 24s
Elapsed time: 34s
Elapsed time: 45s
Target erasing completed
Next target programming
Elapsed time: 63s
```

Programming is completed when *Flashing Completed* message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

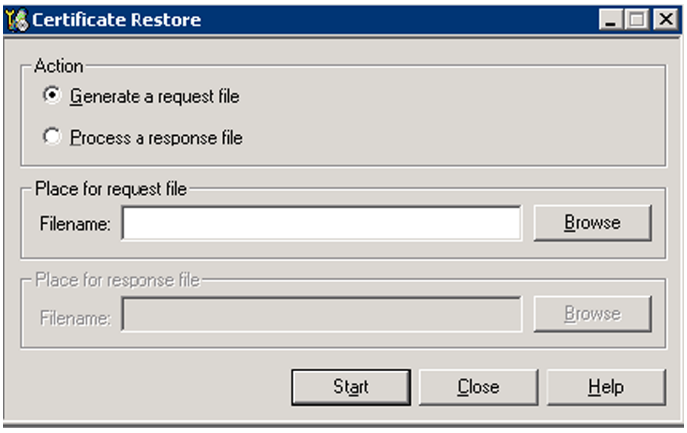
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i To connect the phone with *Phoenix*, choose **File→Scan Product** .

ii Choose **Tools→Certificate Restore** .

iii To choose a location for the request file, click **Browse**.

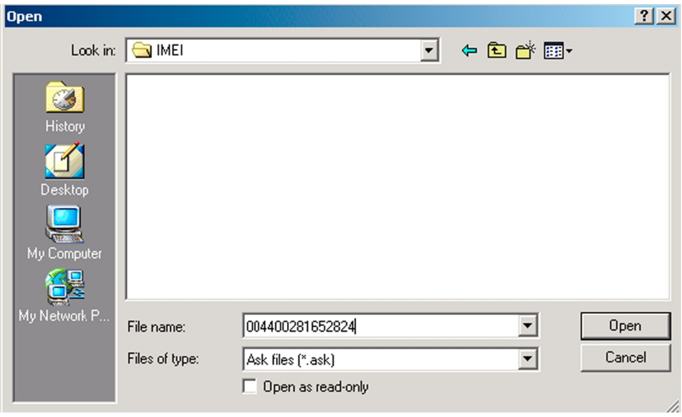

Certificate Restore
Browse
Browse
Start
Close
Help

Action
● Generate a request file
○ Process a response file

Place for request file
Filename:

Place for response file
Filename:

iv Name the file so that you can easily identify it, and click **Open**.


Open
History
Desktop
My Computer
My Network P...
Open
Cancel

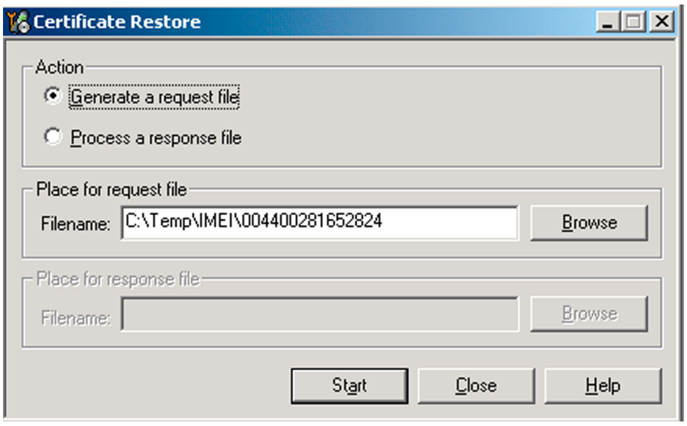
Look in: IMEI

File name: 004400281652824

Files of type: Ask files (*.ask)

☐ Open as read-only

The name of the file and its location are shown.


Certificate Restore
Browse
Browse
Start
Close
Help

Action

● Generate a request file

○ Process a response file

Place for request file

Filename: C:\Temp\IMEI\004400281652824

Place for response file

Filename:

v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

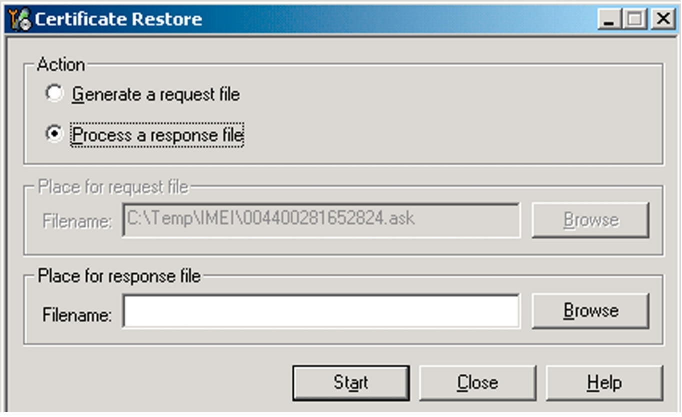
For this procedure, you must supply +12 V to CU-4 from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

iii Choose **File→Scan Product** .

iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.


Certificate Restore
Start
Close
Help
Browse

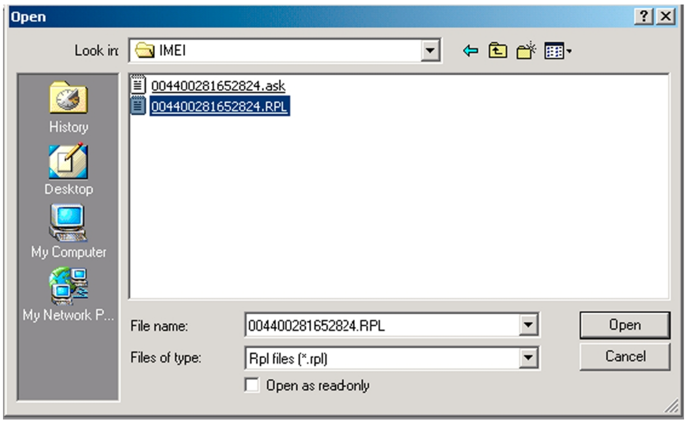
Action
○ Generate a request file
● Process a response file

Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask

Place for response file
Filename:

v To choose the location where response file is saved, click **Browse**.

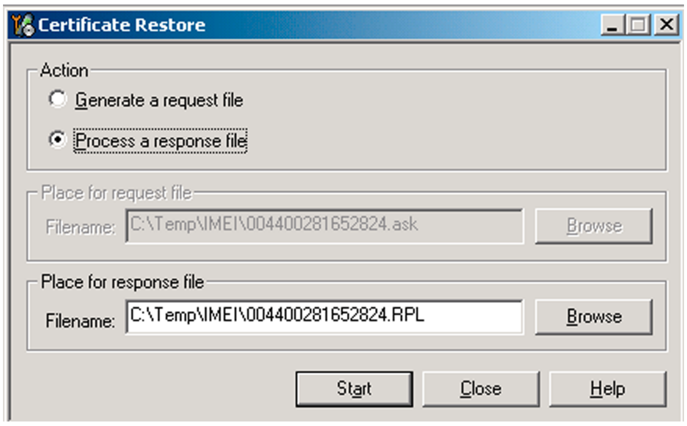
vi Click **Open**.


Open
History
Desktop
My Computer
My Network P...
Open
Cancel

Look in: IMEI
004400281652824.ask
004400281652824.RPL
File name: 004400281652824.RPL
Files of type: Rpl files (*.rpl)
☐ Open as read-only

The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.


Certificate Restore
Start
Close
Help
Browse

Action
○ Generate a request file
● Process a response file

Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask

Place for response file
Filename: C:\Temp\IMEI\004400281652824.RPL

Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

Display module troubleshooting

General instructions for display troubleshooting

The first step is to verify with a working display that the fault is not on the display module itself. The display module cannot be repaired.

The second step is to check that the cellular engine is working normally. This can be done by connecting the phone to a docking station and starting Phoenix service software. With the help of Phoenix read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

After these checks proceed to the display troubleshooting flowcharts. Use the Display Test tool in Phoenix to find the detailed fault mode.

Operating modes of the display

The display is in a normal mode when the phone is in active use.

The display is in a partial idle mode when the phone is in the screen saver mode.

The operating modes of the display can be controlled with the help of Phoenix.

Table 8 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. Backlight is also controlled automatically by the ambient light sensor. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

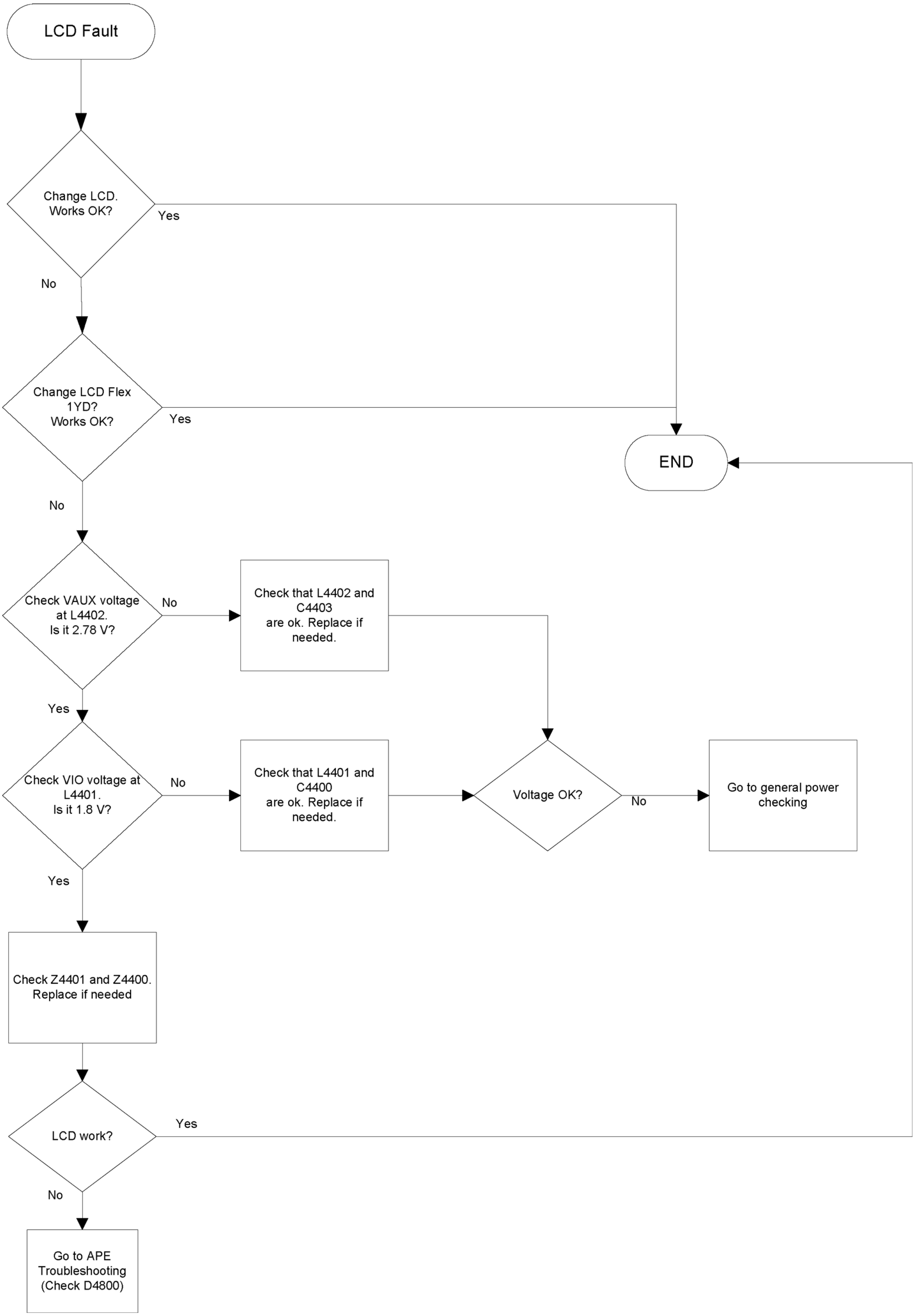
Table 9 Pixel defects

<table>
<tr><th colspan="2">Item</th><th colspan="4">Bright dot defect</th><th colspan="4">Dim dot defect</th></tr>
<tr><td rowspan="10">1</td><td rowspan="10">Defect counts</td><td>R</td><td>G</td><td>B</td><td>Total</td><td>R</td><td>G</td><td>B</td><td>Total</td></tr>
<tr><td>R_0</td><td>G_0</td><td>B_0</td><td rowspan="3">-</td><td rowspan="3"></td><td>G_0</td><td rowspan="3"></td><td rowspan="3">0</td></tr>
<tr><td colspan="3">Acceptable</td><td>0</td></tr>
<tr><td>R_{BL2}</td><td>G_{BL2}</td><td>B_{BL2}</td><td>G_{DL2}</td></tr>
<tr><td colspan="4" rowspan="3"></td><td>R_0</td><td>G_{DM1}</td><td>B_0</td><td rowspan="3">2</td></tr>
<tr><td>2</td><td>2</td><td>2</td></tr>
<tr><td>R_{DM2}</td><td>G_{DM2}</td><td>B_{DM2}</td></tr>
<tr><td>R_{BH1}</td><td>G_{BH1}</td><td>B_{BH1}</td><td rowspan="3">0</td><td>R_{DH1}</td><td>G_{DH1}</td><td>B_{DH1}</td><td rowspan="3">-</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td colspan="3">Acceptable</td></tr>
<tr><td>R_{63}</td><td>G_{63}</td><td>B_{63}</td><td>R_{63}</td><td>G_{63}</td><td>B_{63}</td></tr>
<tr><td>2</td><td>Combined defect counts</td><td colspan="8">No combine dot defect allowed.
*Two Single dim dot defects that are within 5mm of each other should be counted as a combined dot defect.</td></tr>
</table>

Note: Blinking pixels are not allowed in normal operating temperatures and light conditions.

LCD troubleshooting

Troubleshooting flow


LCD Fault
Change LCD. Works OK?
Yes
No
Change LCD Flex 1YD? Works OK?
Yes
No
END
Check VAUX voltage at L4402. Is it 2.78 V?
No
Check that L4402 and C4403 are ok. Replace if needed.
Yes
Check VIO voltage at L4401. Is it 1.8 V?
No
Check that L4401 and C4400 are ok. Replace if needed.
Voltage OK?
No
Go to general power checking
Yes
Check Z4401 and Z4400. Replace if needed
LCD work?
Yes
No
Go to APE Troubleshooting (Check D4800)

Display and keyboard backlight troubleshooting

Context

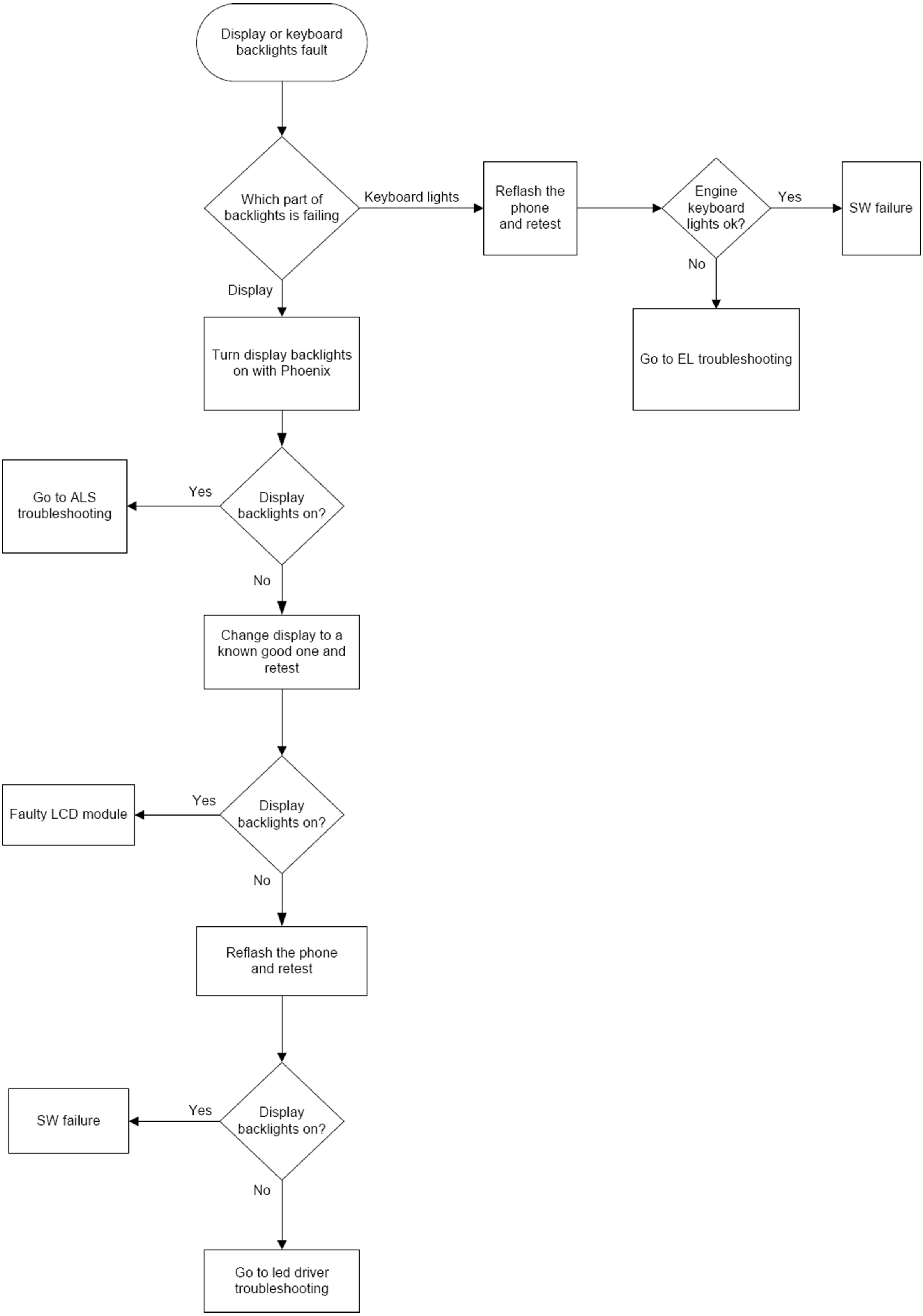
The device has one LED driver that provides current for the display backlight.

The brightness of the display is adjusted by the Ambient Light Sensor (ALS).

You can enable/disable ALS with the help of Phoenix service software.

Display brightness can be adjusted manually, if ALS is disabled. If the ambient light sensor is enabled, it adjusts the display brightness automatically.

Troubleshooting flow


Display or keyboard backlights fault
Which part of backlights is failing
Keyboard lights
Reflash the phone and retest
Engine keyboard lights ok?
Yes
SW failure
No
Go to EL troubleshooting
Display
Turn display backlights on with Phoenix
Display backlights on?
Yes
Go to ALS troubleshooting
No
Change display to a known good one and retest
Display backlights on?
Yes
Faulty LCD module
No
Reflash the phone and retest
Display backlights on?
Yes
SW failure
No
Go to led driver troubleshooting

Related information

- Display fault troubleshooting (page)
- LED driver troubleshooting (page)
- ALS troubleshooting (page 6–33)

ALS troubleshooting

Context

- If a phototransistor is broken, replace it with a typical phototransistor.
- After replacing the phototransistor or if calibration values are lost for some other reason, ALS re-tuning is required.
- Before starting the ALS calibration procedure, perform the 'Pull-up resistor calibration' in dark lighting conditions, and write the measured 'correction' value to the phone. After this ALS calibration procedure is performed, and the default co-efficient value '1' is written to the phone.
- Make sure that you have completed **Display and keypad backlight troubleshooting** first before starting **ALS troubleshooting**.

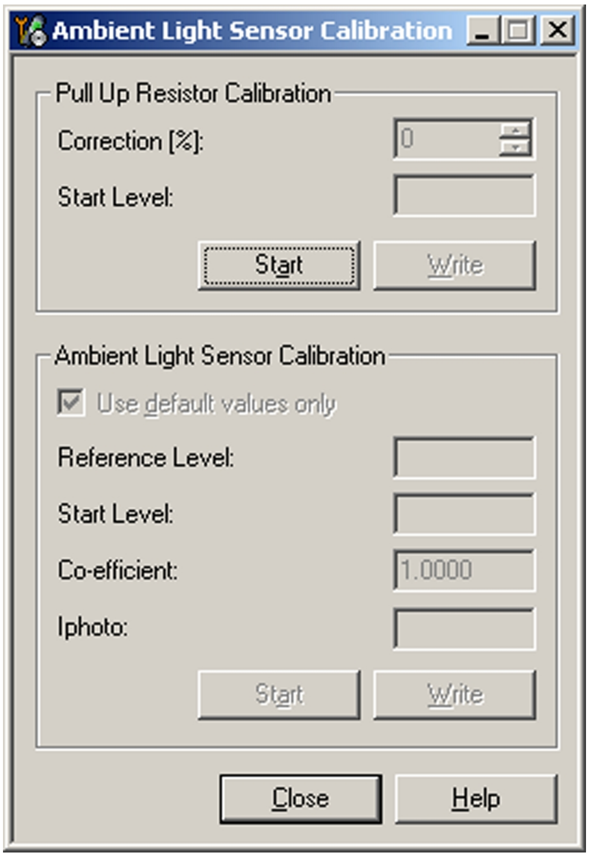
Here are some hints for ALS troubleshooting; the following troubleshooting diagram refers to these:

- *Phoenix* LED control tool also shows you luminance. The correct luminance in darkness is <20 lx, and in office environment 100-2000 lx. The luminance value depends strongly on the light source and the angle of the phone, so these values are only a rough guideline.
- LED driver control voltage measurement points can be found from the **LED driver troubleshooting** section. When backlight brightness is set to 100%, both GENOUT signals are low, and enable PWM is 100%.
- *Phoenix* has an ambient light sensor calibration tool for changing calibration values. The pull-up resistor calibration is done first. See the following procedure.

Steps

1. Cover the light guide (upper part of the A-Cover).
2. Start *Phoenix*.
3. Choose **File→Scan Product.**

4. Choose **Tuning→Ambient Light Sensor Calibration.**

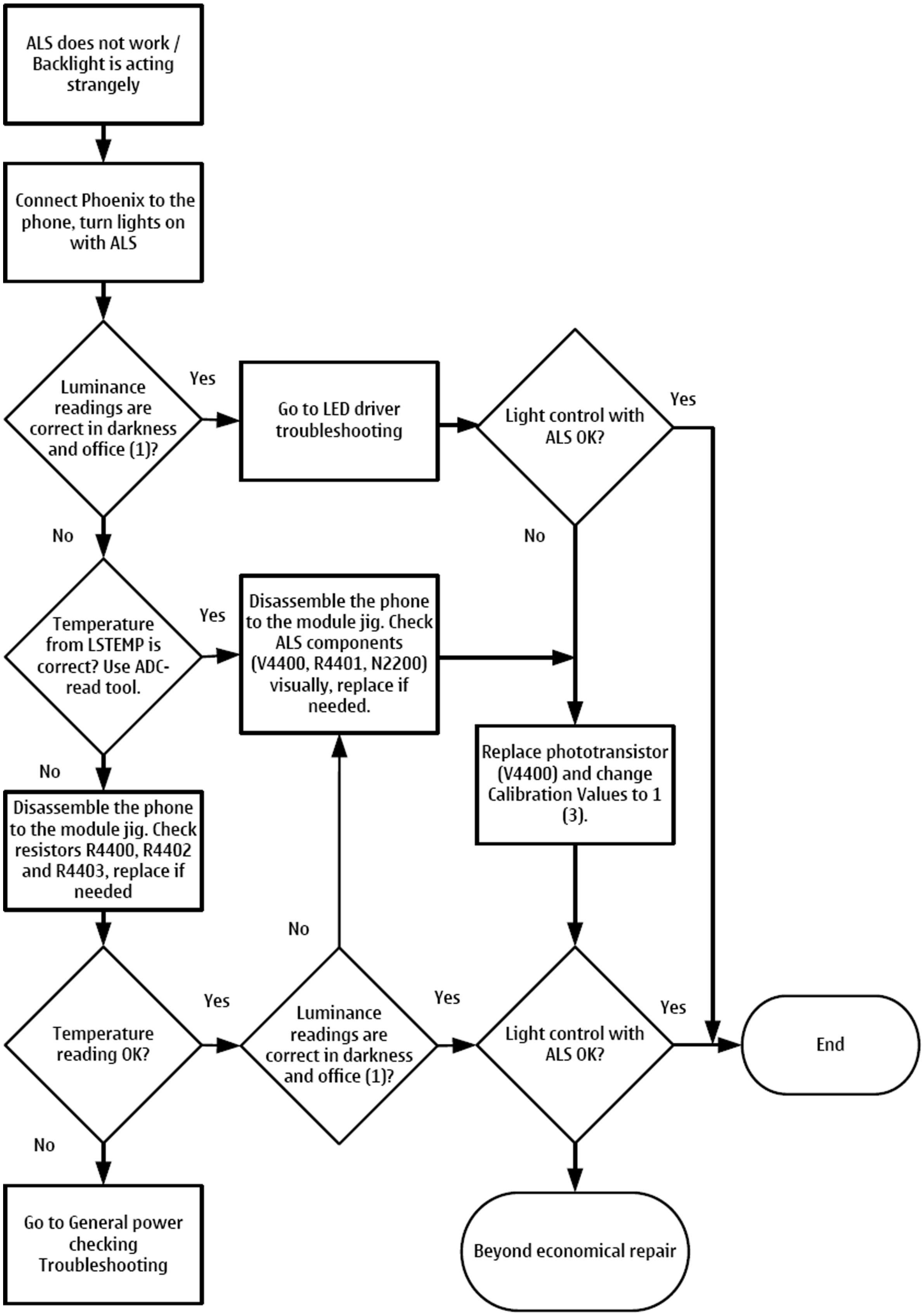

Ambient Light Sensor Calibration
Pull Up Resistor Calibration
Start
Write
Ambient Light Sensor Calibration
Start
Write
Close
Help

Correction [%]: 0
Start Level:
☑ Use default values only
Reference Level:
Start Level:
Co-efficient: 1.0000
Iphoto:

Figure 33 ***Ambient Light Sensor Calibration*** **window**

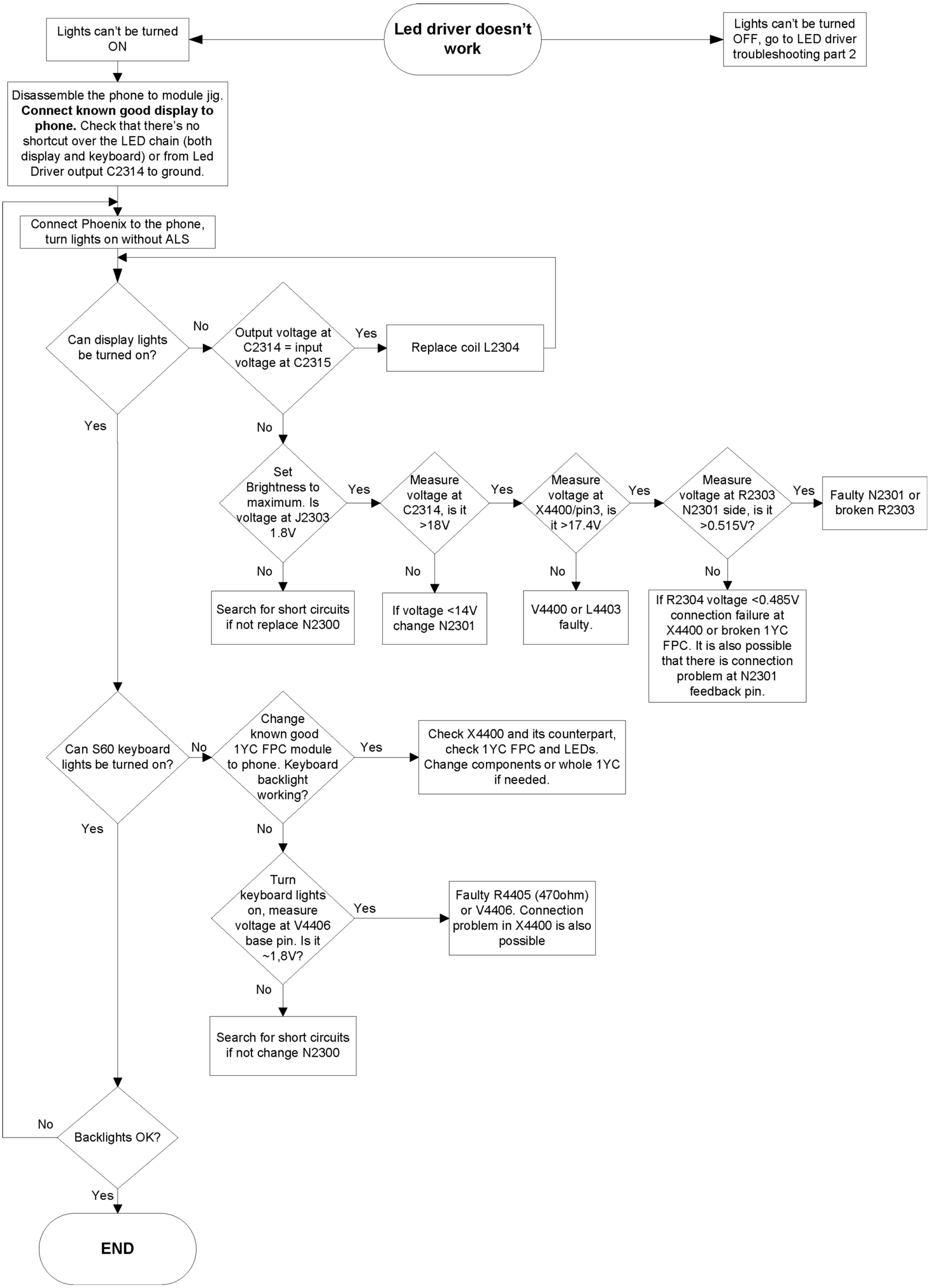
5. In the *Pull Up Resistor Calibration* pane, click **Start**, and **Write**.
6. In the *Ambient Light Sensor Calibration* pane, check the **Use default values only** check box, and click **Write**.
7. To end the calibration, click **Close**.

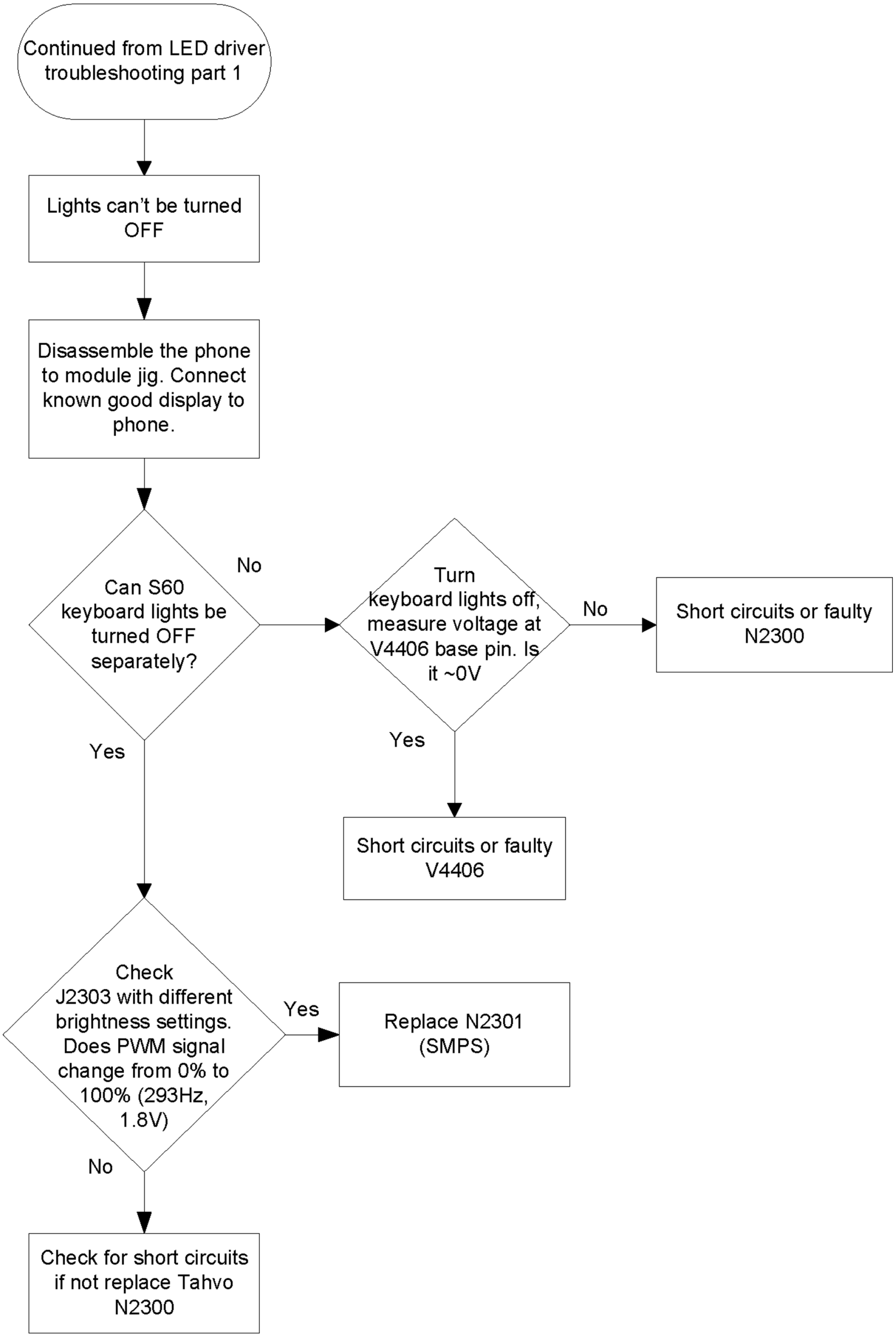
Troubleshooting flow


ALS does not work / Backlight is acting strangely
Connect Phoenix to the phone, turn lights on with ALS
Luminance readings are correct in darkness and office (1)?
Yes
Go to LED driver troubleshooting
Light control with ALS OK?
Yes
No
No
Temperature from LSTEMP is correct? Use ADC-read tool.
Yes
Disassemble the phone to the module jig. Check ALS components (V4400, R4401, N2200) visually, replace if needed.
Replace phototransistor (V4400) and change Calibration Values to 1 (3).
No
Disassemble the phone to the module jig. Check resistors R4400, R4402 and R4403, replace if needed
No
Temperature reading OK?
Yes
Luminance readings are correct in darkness and office (1)?
Yes
Light control with ALS OK?
Yes
End
No
Go to General power checking Troubleshooting
Beyond economical repair

LED driver troubleshooting

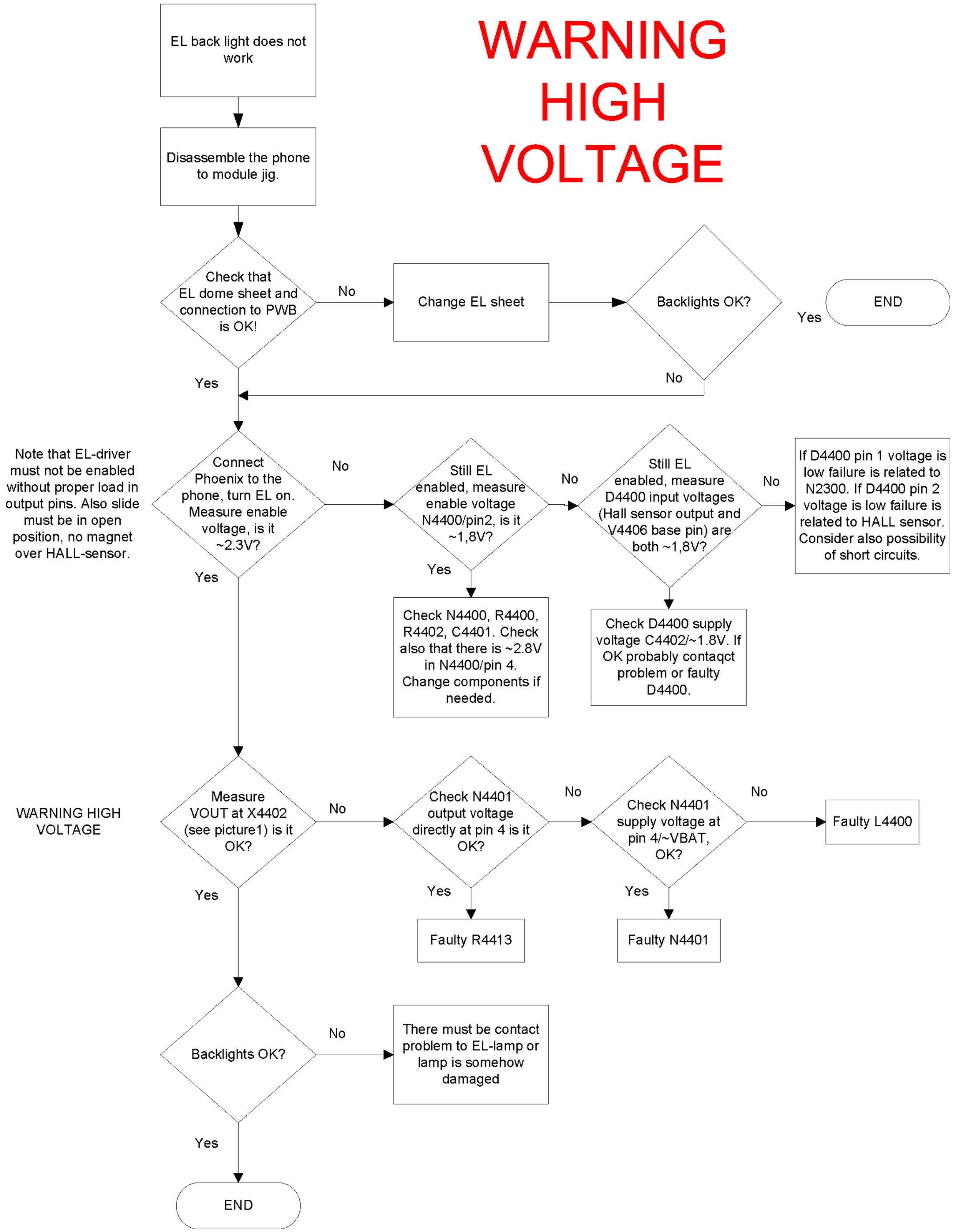
Troubleshooting flow

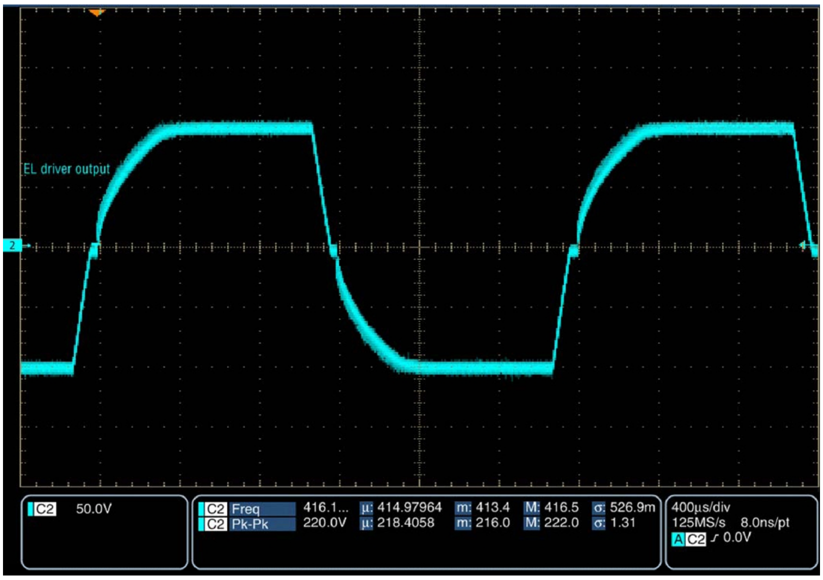

Led driver doesn't work
Lights can't be turned ON
Lights can't be turned OFF, go to LED driver troubleshooting part 2
Disassemble the phone to module jig. Connect known good display to phone. Check that there's no shortcut over the LED chain (both display and keyboard) or from Led Driver output C2314 to ground.
Connect Phoenix to the phone, turn lights on without ALS
Can display lights be turned on?
No
Output voltage at C2314 = input voltage at C2315
Yes
Replace coil L2304
Yes
No
Set Brightness to maximum. Is voltage at J2303 1.8V
Yes
Measure voltage at C2314, is it >18V
Yes
Measure voltage at X4400/pin3, is it >17.4V
Yes
Measure voltage at R2303 N2301 side, is it >0.515V?
Yes
Faulty N2301 or broken R2303
No
Search for short circuits if not replace N2300
No
If voltage <14V change N2301
No
V4400 or L4403 faulty.
No
If R2304 voltage <0.485V connection failure at X4400 or broken 1YC FPC. It is also possible that there is connection problem at N2301 feedback pin.
Can S60 keyboard lights be turned on?
No
Change known good 1YC FPC module to phone. Keyboard backlight working?
Yes
Check X4400 and its counterpart, check 1YC FPC and LEDs. Change components or whole 1YC if needed.
Yes
No
Turn keyboard lights on, measure voltage at V4406 base pin. Is it ~1,8V?
Yes
Faulty R4405 (470ohm) or V4406. Connection problem in X4400 is also possible
No
Search for short circuits if not change N2300
No
Backlights OK?
Yes
END


Continued from LED driver troubleshooting part 1
Lights can't be turned OFF
Disassemble the phone to module jig. Connect known good display to phone.
Can S60 keyboard lights be turned OFF separately?
No
Turn keyboard lights off, measure voltage at V4406 base pin. Is it ~0V
No
Short circuits or faulty N2300
Yes
Short circuits or faulty V4406
Yes
Check J2303 with different brightness settings. Does PWM signal change from 0% to 100% (293Hz, 1.8V)
Yes
Replace N2301 (SMPS)
No
Check for short circuits if not replace Tahvo N2300

EL backlight fault troubleshooting

Troubleshooting flow


WARNING
HIGH
VOLTAGE
EL back light does not work
Disassemble the phone to module jig.
Check that EL dome sheet and connection to PWB is OK!
No
Change EL sheet
Backlights OK?
Yes
END
No
Yes
Note that EL-driver must not be enabled without proper load in output pins. Also slide must be in open position, no magnet over HALL-sensor.
Connect Phoenix to the phone, turn EL on. Measure enable voltage, is it ~2.3V?
No
Still EL enabled, measure enable voltage N4400/pin2, is it ~1,8V?
No
Still EL enabled, measure D4400 input voltages (Hall sensor output and V4406 base pin) are both ~1,8V?
No
If D4400 pin 1 voltage is low failure is related to N2300. If D4400 pin 2 voltage is low failure is related to HALL sensor. Consider also possibility of short circuits.
Yes
Yes
Check N4400, R4400, R4402, C4401. Check also that there is ~2.8V in N4400/pin 4. Change components if needed.
Check D4400 supply voltage C4402/~1.8V. If OK probably contaqct problem or faulty D4400.
WARNING HIGH VOLTAGE
Measure VOUT at X4402 (see picture1) is it OK?
No
Check N4401 output voltage directly at pin 4 is it OK?
No
Check N4401 supply voltage at pin 4/~VBAT, OK?
No
Faulty L4400
Yes
Yes
Faulty R4413
Yes
Faulty N4401
Backlights OK?
No
There must be contact problem to EL-lamp or lamp is somehow damaged
Yes
END



Bluetooth troubleshooting

Introduction to Bluetooth troubleshooting

There are two main Bluetooth problems that can occur:

Problem	Description
Detachment of the BT antenna.	This would most likely happen if the device has been dropped repeatedly to the ground. It could cause the BT antenna to become loose or partially detached from the PWB. (see next page for details about BT antenna HW and Mechanics)
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

Location of the Bluetooth/WLAN antenna

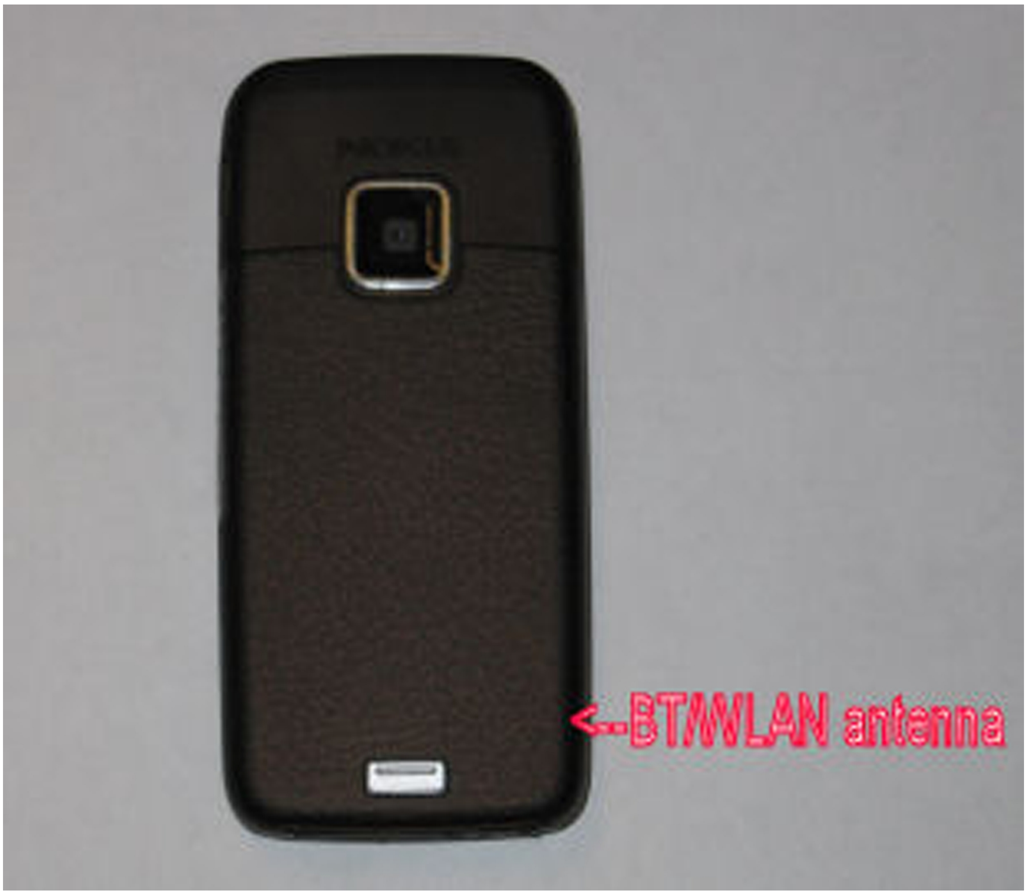
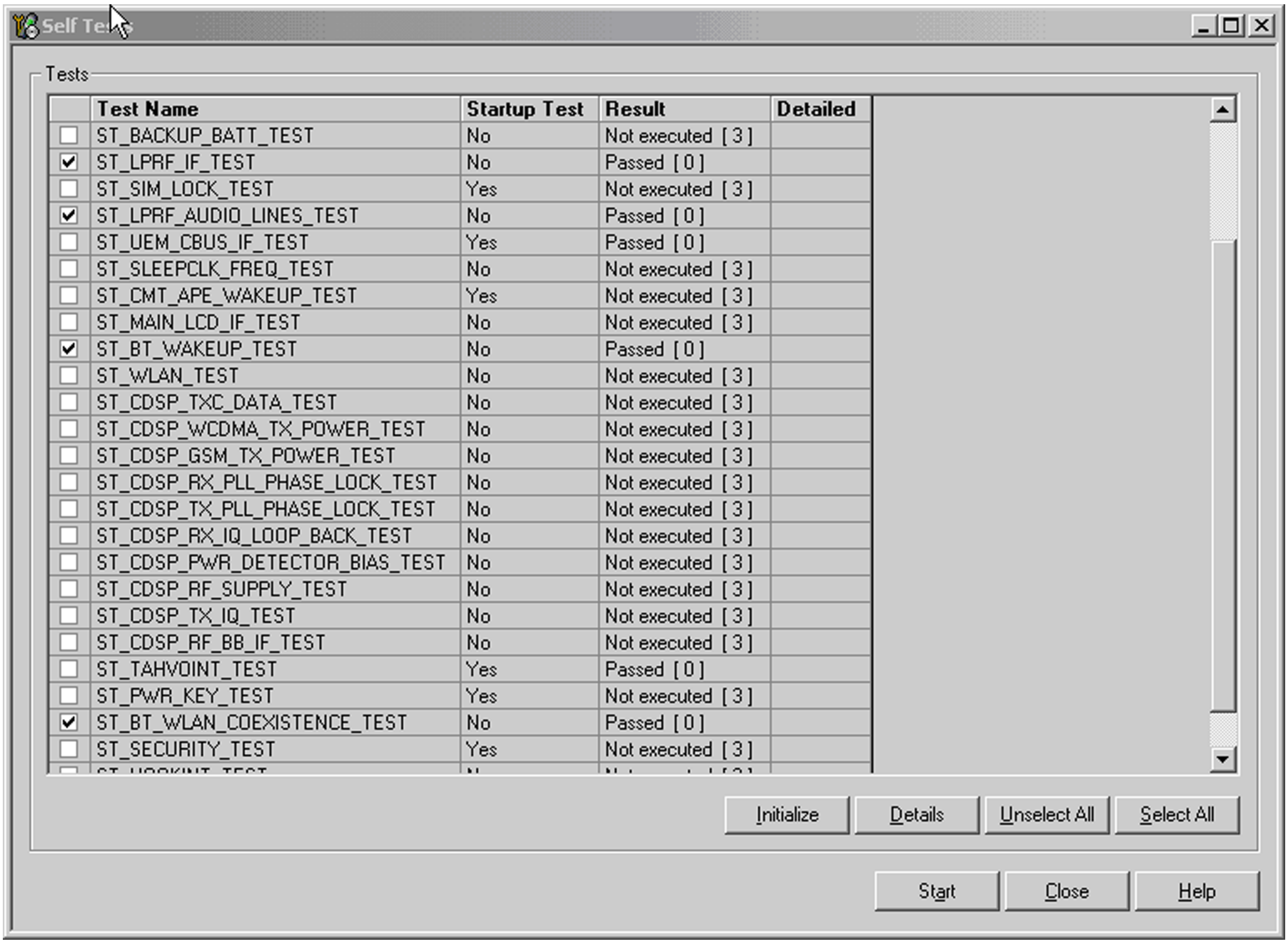


Figure 34 BT/WLAN antenna location

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Connect the phone to a docking station in the local mode.
4. Choose **Testing→Self Tests** .
5. Choose the following Bluetooth related tests:
    - ST_LPRF_IF_TEST
    - ST_LPRF_AUDIO_LINES_TEST
    - ST_BT_WAKEUP_TEST
    - ST_BT _WLAN_COEXISTENCE_TEST



	Test Name	Startup Test	Result	Detailed
☐	ST_BACKUP_BATT_TEST	No	Not executed [3]	
☑	ST_LPRF_IF_TEST	No	Passed [0]	
☐	ST_SIM_LOCK_TEST	Yes	Not executed [3]	
☑	ST_LPRF_AUDIO_LINES_TEST	No	Passed [0]	
☐	ST_UEM_CBUS_IF_TEST	Yes	Passed [0]	
☐	ST_SLEEPCLK_FREQ_TEST	No	Not executed [3]	
☐	ST_CMT_APE_WAKEUP_TEST	Yes	Not executed [3]	
☐	ST_MAIN_LCD_IF_TEST	No	Not executed [3]	
☑	ST_BT_WAKEUP_TEST	No	Passed [0]	
☐	ST_WLAN_TEST	No	Not executed [3]	
☐	ST_CDSP_TXC_DATA_TEST	No	Not executed [3]	
☐	ST_CDSP_WCDMA_TX_POWER_TEST	No	Not executed [3]	
☐	ST_CDSP_GSM_TX_POWER_TEST	No	Not executed [3]	
☐	ST_CDSP_RX_PLL_PHASE_LOCK_TEST	No	Not executed [3]	
☐	ST_CDSP_TX_PLL_PHASE_LOCK_TEST	No	Not executed [3]	
☐	ST_CDSP_RX_IQ_LOOP_BACK_TEST	No	Not executed [3]	
☐	ST_CDSP_PWR_DETECTOR_BIAS_TEST	No	Not executed [3]	
☐	ST_CDSP_RF_SUPPLY_TEST	No	Not executed [3]	
☐	ST_CDSP_TX_IQ_TEST	No	Not executed [3]	
☐	ST_CDSP_RF_BB_IF_TEST	No	Not executed [3]	
☐	ST_TAHVOINT_TEST	Yes	Passed [0]	
☐	ST_PWR_KEY_TEST	Yes	Not executed [3]	
☑	ST_BT_WLAN_COEXISTENCE_TEST	No	Passed [0]	
☐	ST_SECURITY_TEST	Yes	Not executed [3]	

Figure 35 Bluetooth self tests in *Phoenix*

6. To run the test, click **Start**. When the results are **Passed (0)**, the BT Self Test is accepted.

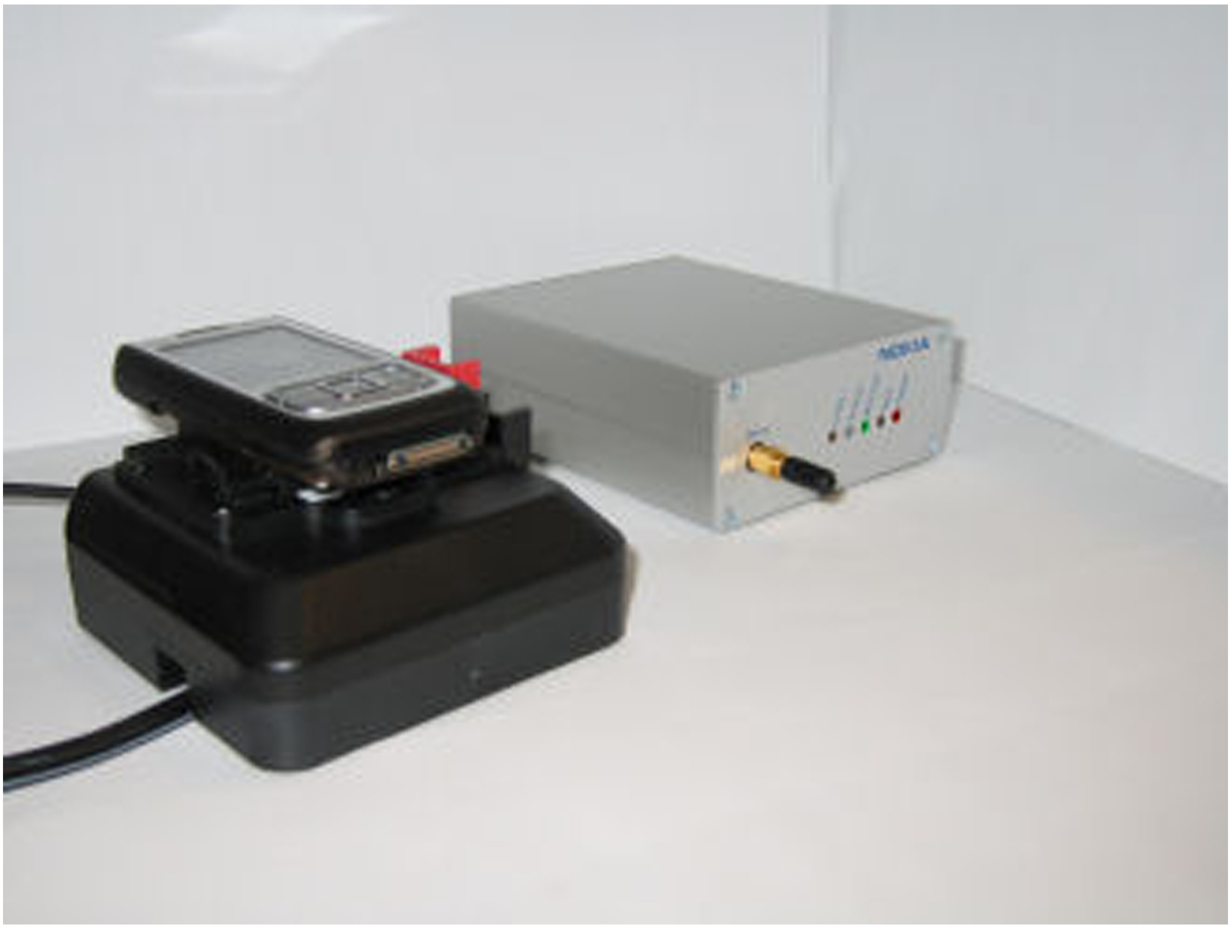
Bluetooth BER tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Connect the phone to a docking station in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-3's or SB-6's serial number (12 digits) found in the type label on the back of BT-box.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the "Counterpart BT Device Address" line.

   This needs to be done only once provided that JBT-3 or SB-6 is not changed.

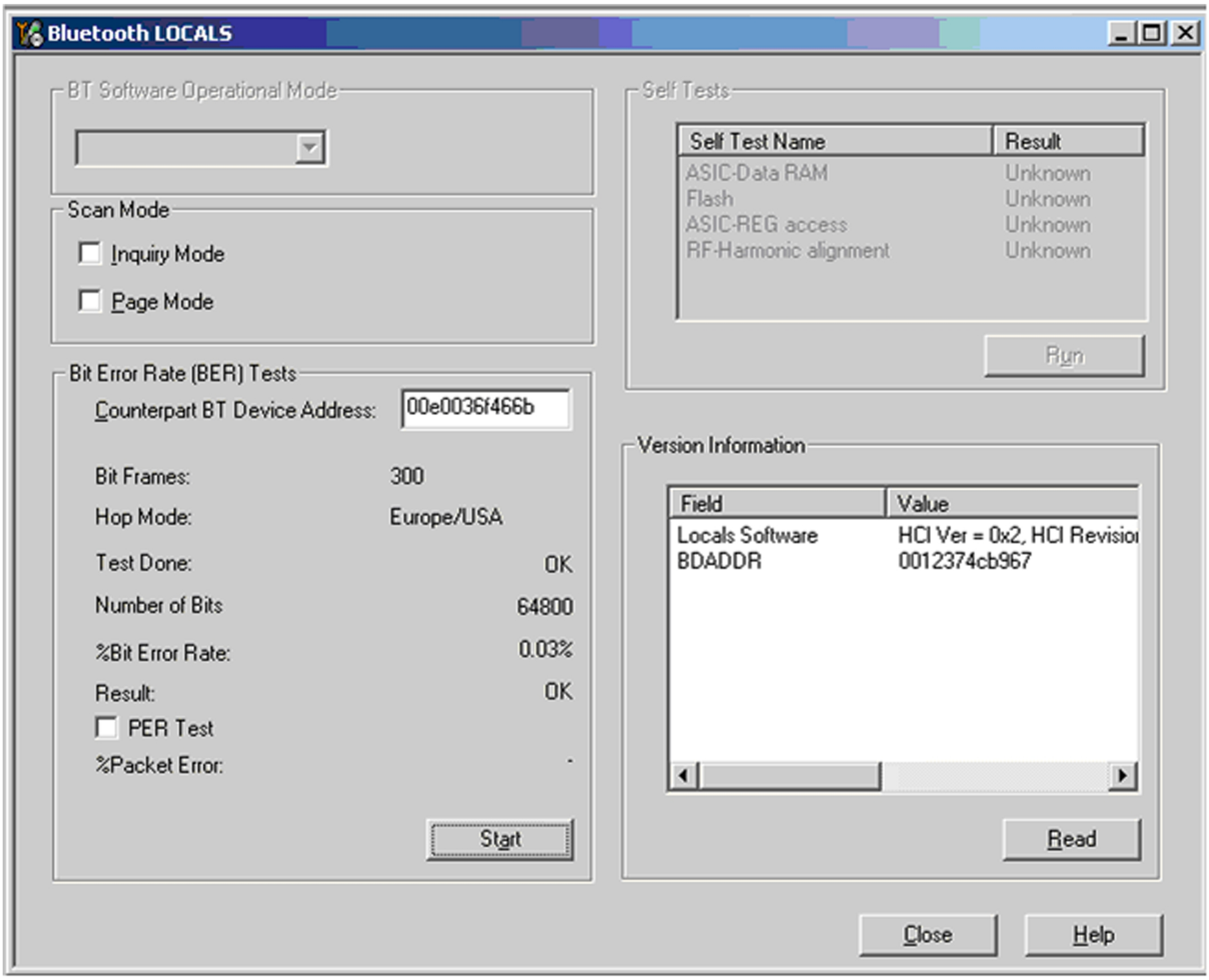
7. Place the BT box near (within 10 – 15 cm) to the BT antenna.



8. To run the tests, click **Run BER Test**.

Results

When the BER Test Result is **below 0.1%** (depending on distance), the test is passed.


Bluetooth LOCALS
BT Software Operational Mode
Scan Mode
Bit Error Rate (BER) Tests
Self Tests
Run
Version Information
Start
Read
Close
Help

☐ Inquiry Mode

☐ Page Mode

Counterpart BT Device Address: 00e0036f466b

Bit Frames: 300

Hop Mode: Europe/USA

Test Done: OK

Number of Bits: 64800

%Bit Error Rate: 0.03%

Result: OK

☐ PER Test

%Packet Error: -

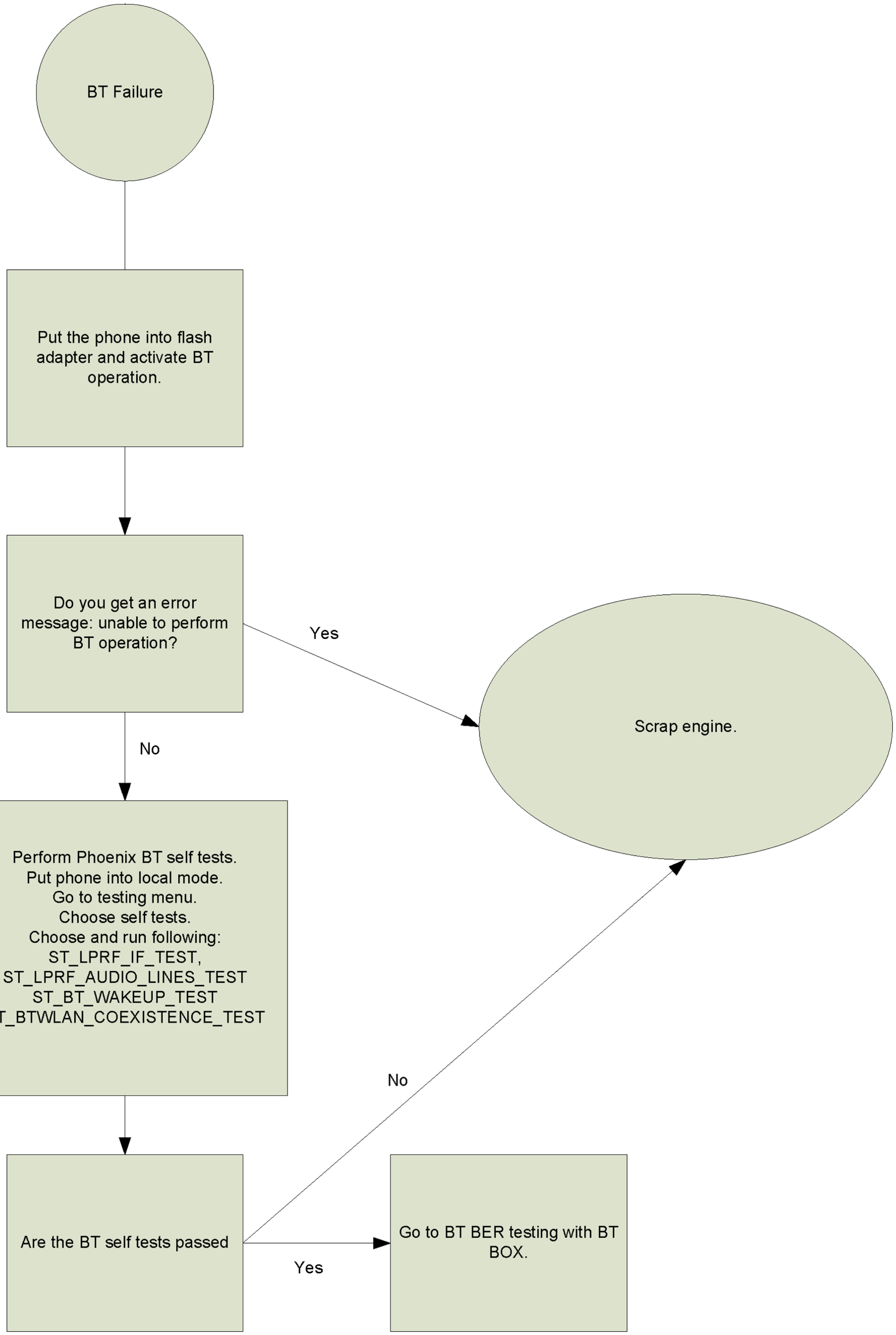
Self Test Name	Result
ASIC-Data RAM	Unknown
Flash	Unknown
ASIC-REG access	Unknown
RF-Harmonic alignment	Unknown

Field	Value
Locals Software	HCI Ver = 0x2, HCI Revisio
BDADDR	0012374cb967

Figure 36 Bluetooth BER test in Phoenix

BT failure troubleshooting

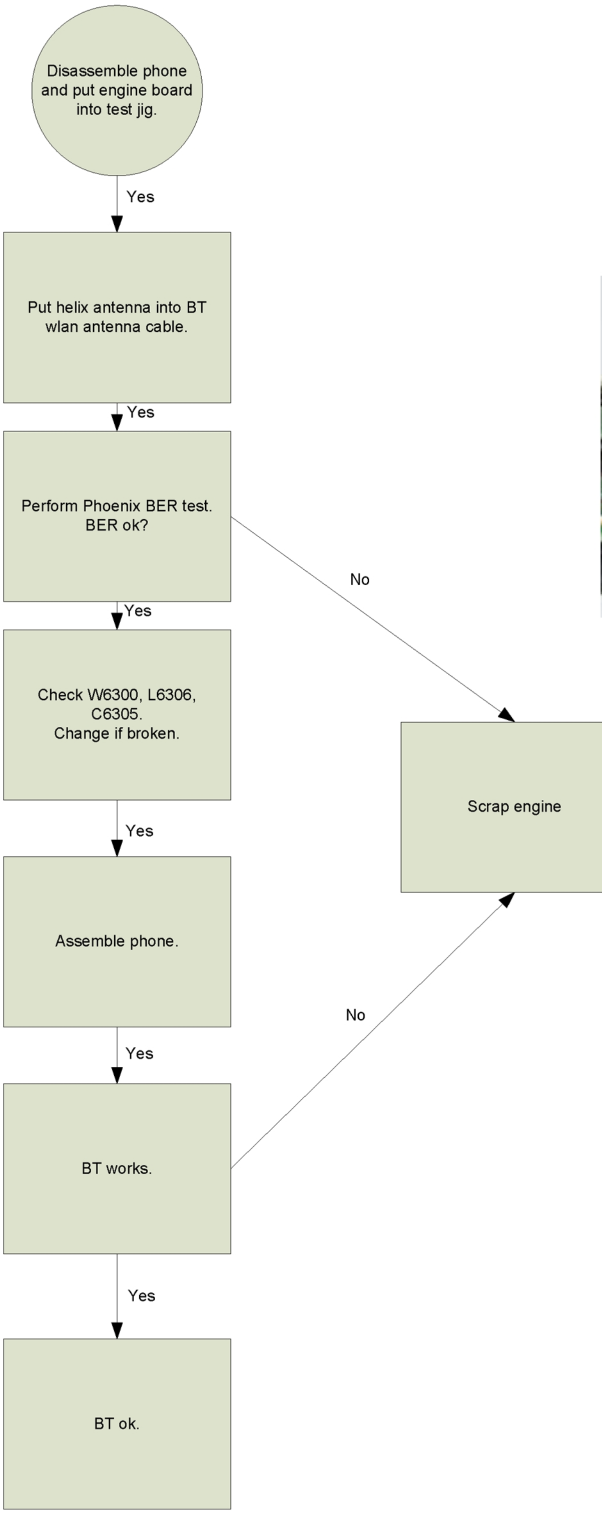
Troubleshooting flow

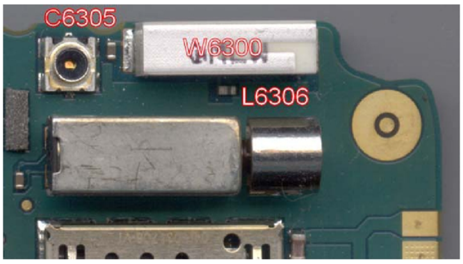

BT Failure
Put the phone into flash adapter and activate BT operation.
Do you get an error message: unable to perform BT operation?
Yes
Scrap engine.
No
Perform Phoenix BT self tests.
Put phone into local mode.
Go to testing menu.
Choose self tests.
Choose and run following:
ST_LPRF_IF_TEST,
ST_LPRF_AUDIO_LINES_TEST
ST_BT_WAKEUP_TEST
ST_BTWLAN_COEXISTENCE_TEST
No
Are the BT self tests passed
Yes
Go to BT BER testing with BT BOX.

Bluetooth BER failure troubleshooting

Troubleshooting flow

Check that the BT/WLAN antenna is working correctly.


Disassemble phone and put engine board into test jig.
Yes
Put helix antenna into BT wlan antenna cable.
Yes
Perform Phoenix BER test. BER ok?
No
Yes
Check W6300, L6306, C6305. Change if broken.
Yes
Scrap engine
Assemble phone.
Yes
No
BT works.
Yes
BT ok.


C6305
W6300
L6306

Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	X2100 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	X2101 pads					
Internal Mic to External Earpiece	B2100 (OUT/GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

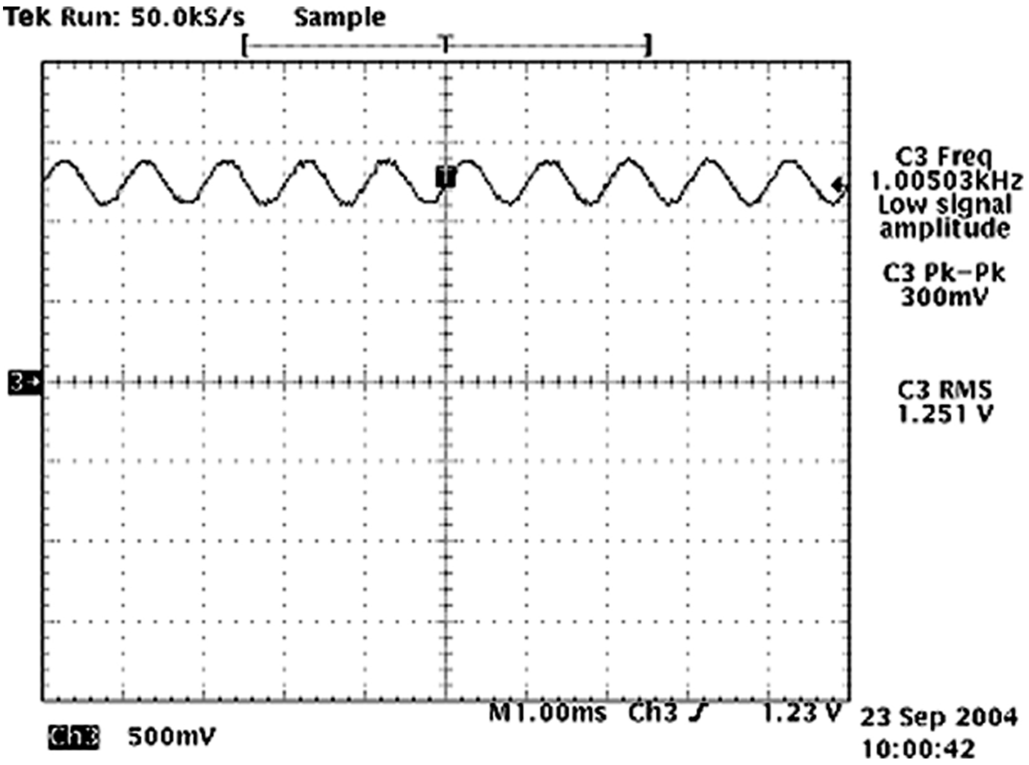
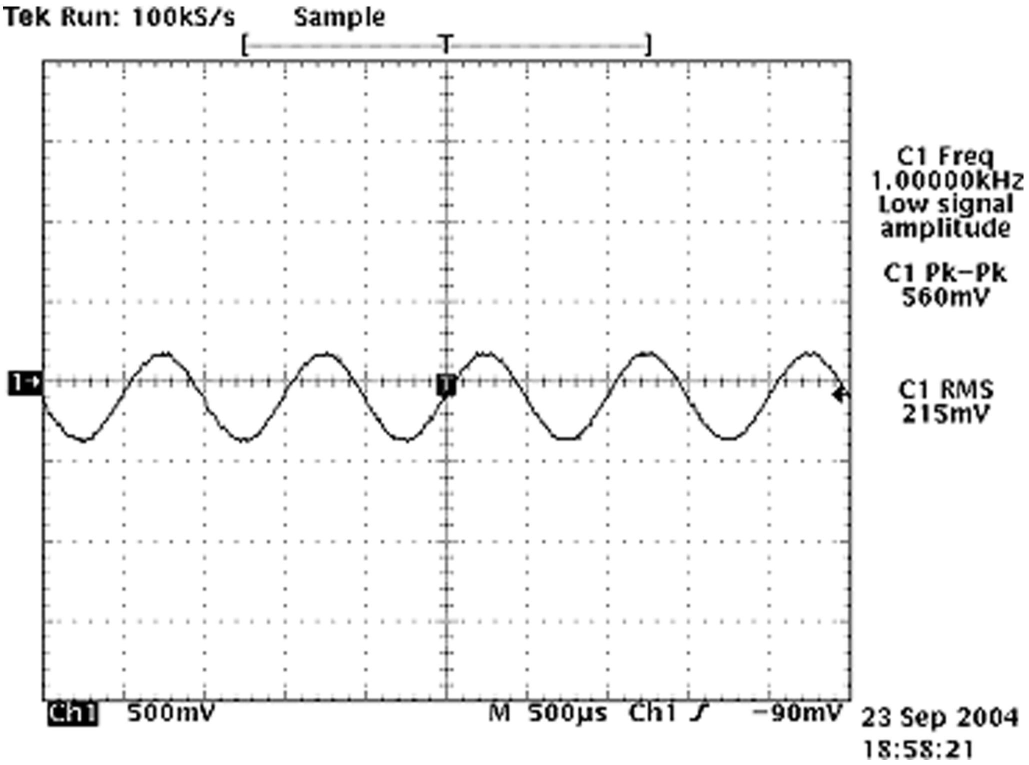


Figure 37 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 38 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

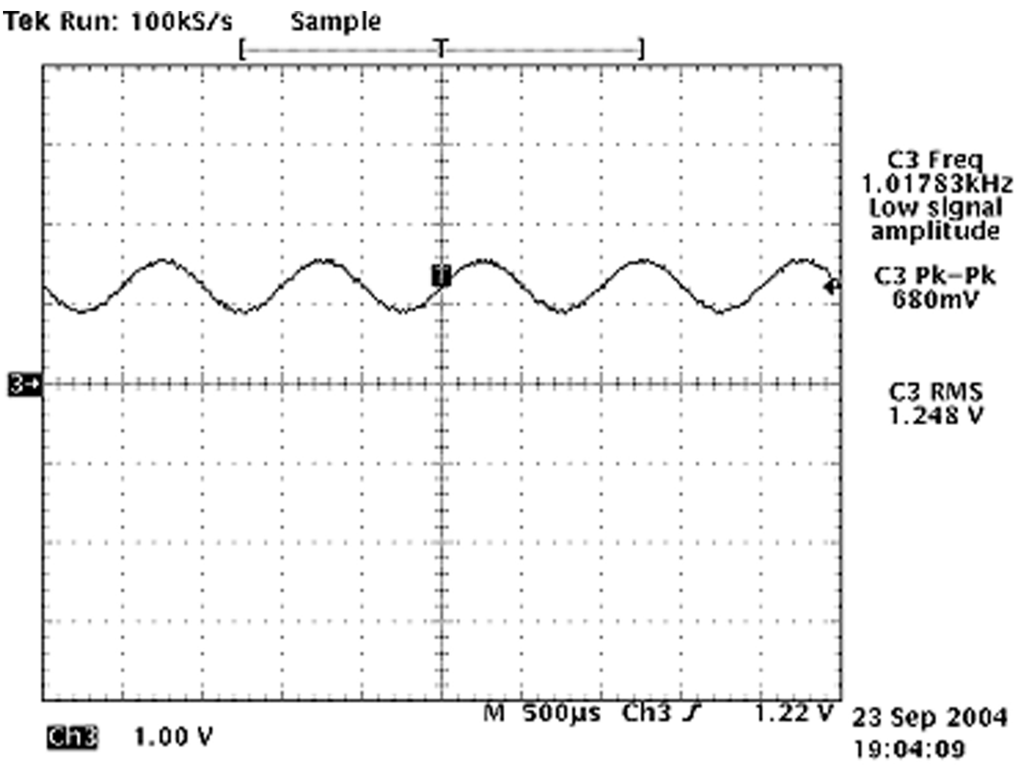
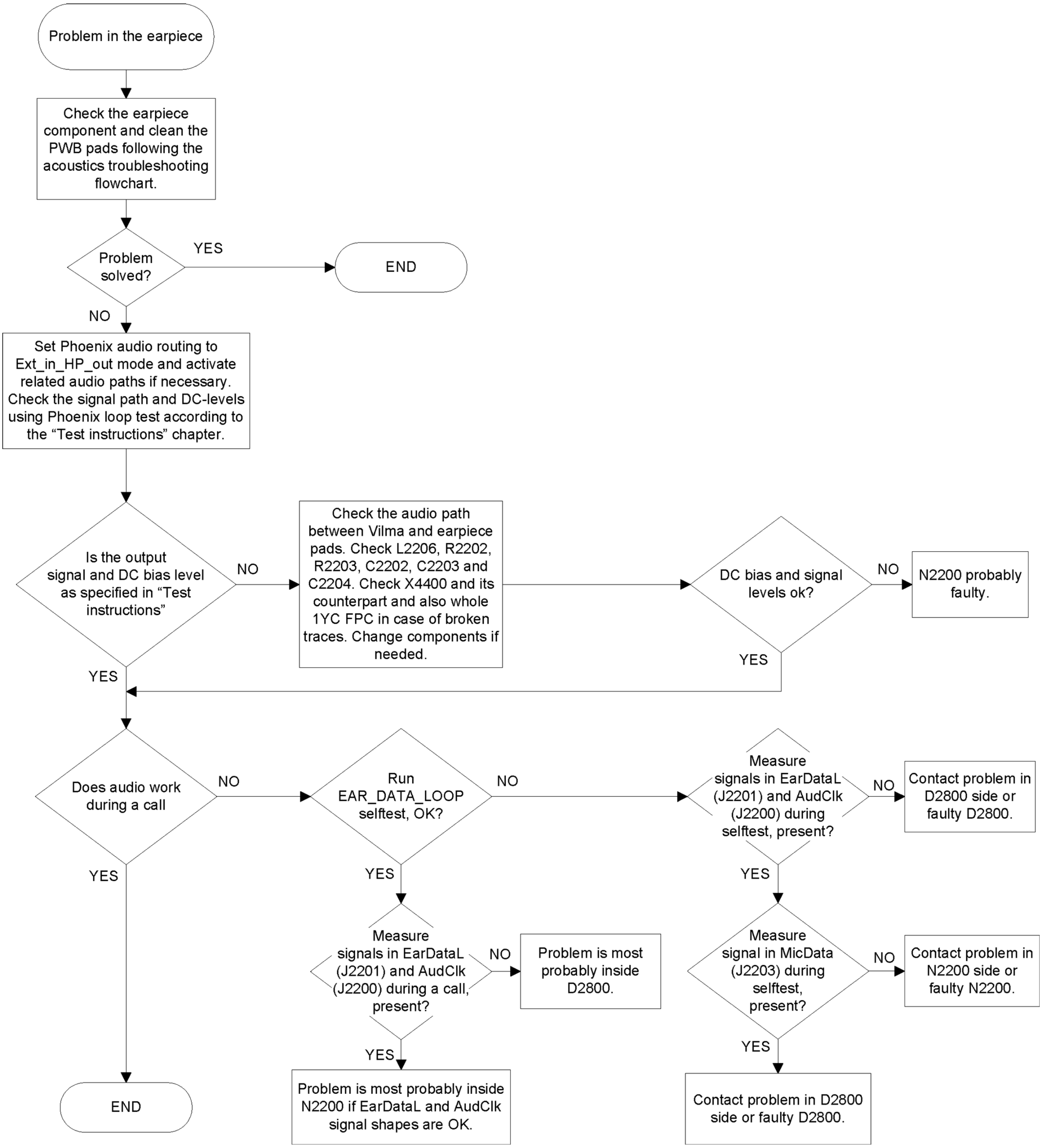

Tek Run: 100kS/s Sample
C3 Freq
1.01783kHz
Low signal
amplitude
C3 Pk-Pk
680mV
C3 RMS
1.248 V
3→
Ch3 1.00 V
M 500µs Ch3 ∫ 1.22 V
23 Sep 2004
19:04:09

Figure 39 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

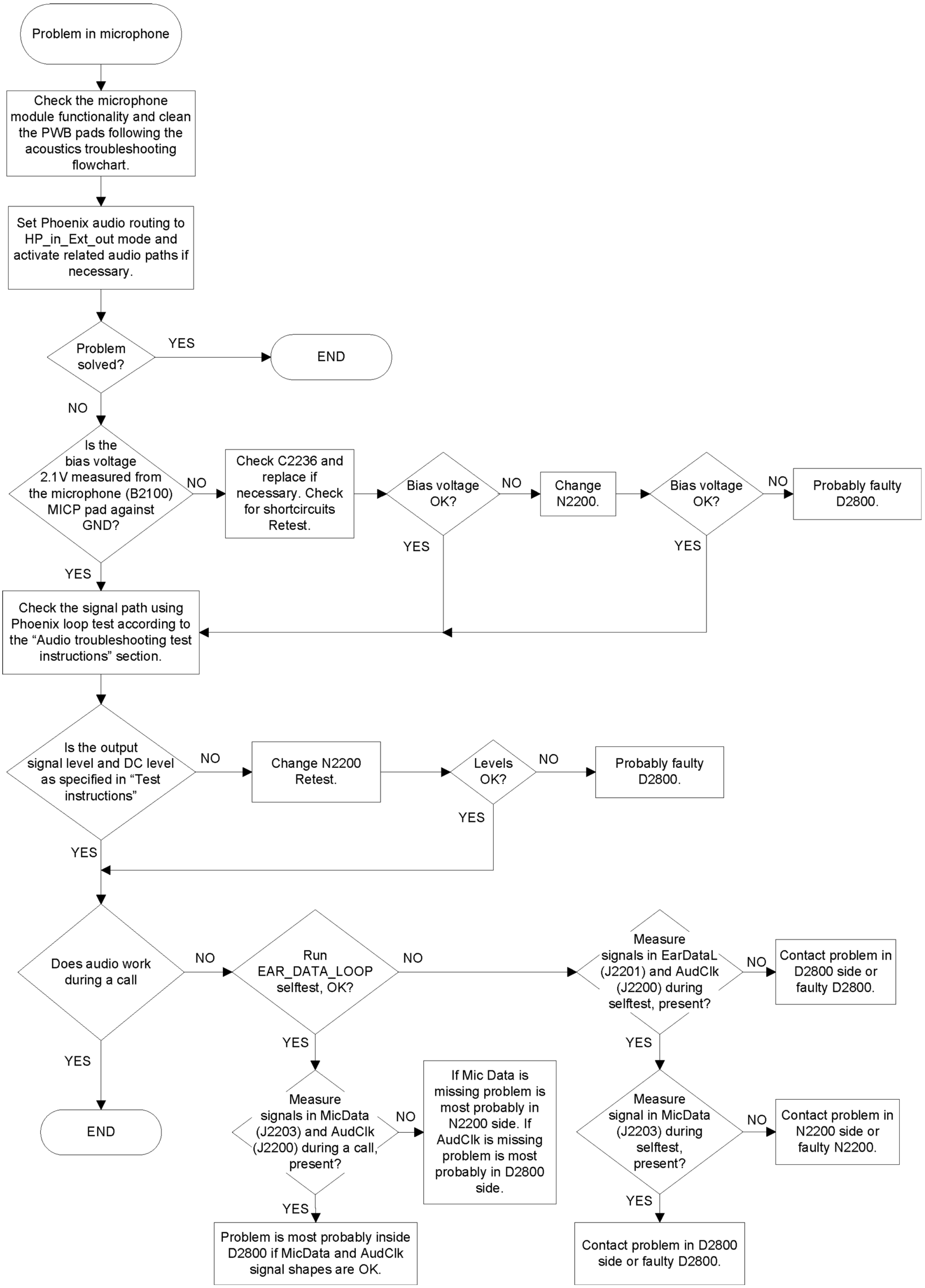
Internal earpiece troubleshooting

Troubleshooting flow


Problem in the earpiece
Check the earpiece component and clean the PWB pads following the acoustics troubleshooting flowchart.
Problem solved?
YES
END
NO
Set Phoenix audio routing to Ext_in_HP_out mode and activate related audio paths if necessary. Check the signal path and DC-levels using Phoenix loop test according to the "Test instructions" chapter.
Is the output signal and DC bias level as specified in "Test instructions"
NO
Check the audio path between Vilma and earpiece pads. Check L2206, R2202, R2203, C2202, C2203 and C2204. Check X4400 and its counterpart and also whole 1YC FPC in case of broken traces. Change components if needed.
DC bias and signal levels ok?
NO
N2200 probably faulty.
YES
YES
Does audio work during a call
NO
Run EAR_DATA_LOOP selftest, OK?
NO
Measure signals in EarDataL (J2201) and AudClk (J2200) during selftest, present?
NO
Contact problem in D2800 side or faulty D2800.
YES
YES
YES
Measure signals in EarDataL (J2201) and AudClk (J2200) during a call, present?
NO
Problem is most probably inside D2800.
Measure signal in MicData (J2203) during selftest, present?
NO
Contact problem in N2200 side or faulty N2200.
YES
YES
END
Problem is most probably inside N2200 if EarDataL and AudClk signal shapes are OK.
Contact problem in D2800 side or faulty D2800.

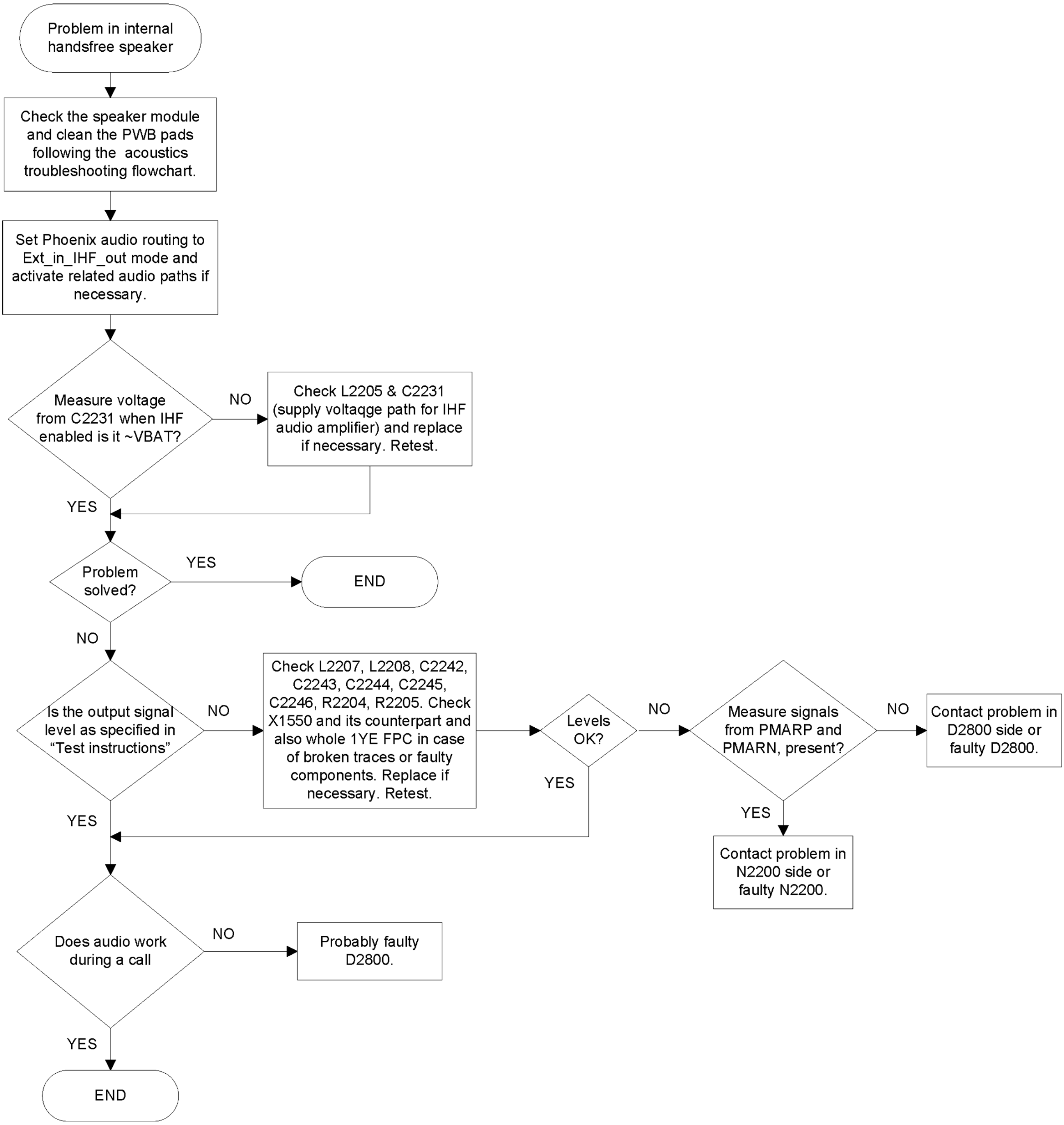
Internal microphone troubleshooting

Troubleshooting flow


Problem in microphone
Check the microphone module functionality and clean the PWB pads following the acoustics troubleshooting flowchart.
Set Phoenix audio routing to HP_in_Ext_out mode and activate related audio paths if necessary.
Problem solved?
YES
END
NO
Is the bias voltage 2.1V measured from the microphone (B2100) MICP pad against GND?
NO
Check C2236 and replace if necessary. Check for shortcircuits Retest.
Bias voltage OK?
NO
Change N2200.
Bias voltage OK?
NO
Probably faulty D2800.
YES
YES
YES
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section.
Is the output signal level and DC level as specified in "Test instructions"
NO
Change N2200 Retest.
Levels OK?
NO
Probably faulty D2800.
YES
YES
Does audio work during a call
NO
Run EAR_DATA_LOOP selftest, OK?
NO
Measure signals in EarDataL (J2201) and AudClk (J2200) during selftest, present?
NO
Contact problem in D2800 side or faulty D2800.
YES
END
YES
Measure signals in MicData (J2203) and AudClk (J2200) during a call, present?
NO
If Mic Data is missing problem is most probably in N2200 side. If AudClk is missing problem is most probably in D2800 side.
YES
Problem is most probably inside D2800 if MicData and AudClk signal shapes are OK.
YES
Measure signal in MicData (J2203) during selftest, present?
NO
Contact problem in N2200 side or faulty N2200.
YES
Contact problem in D2800 side or faulty D2800.

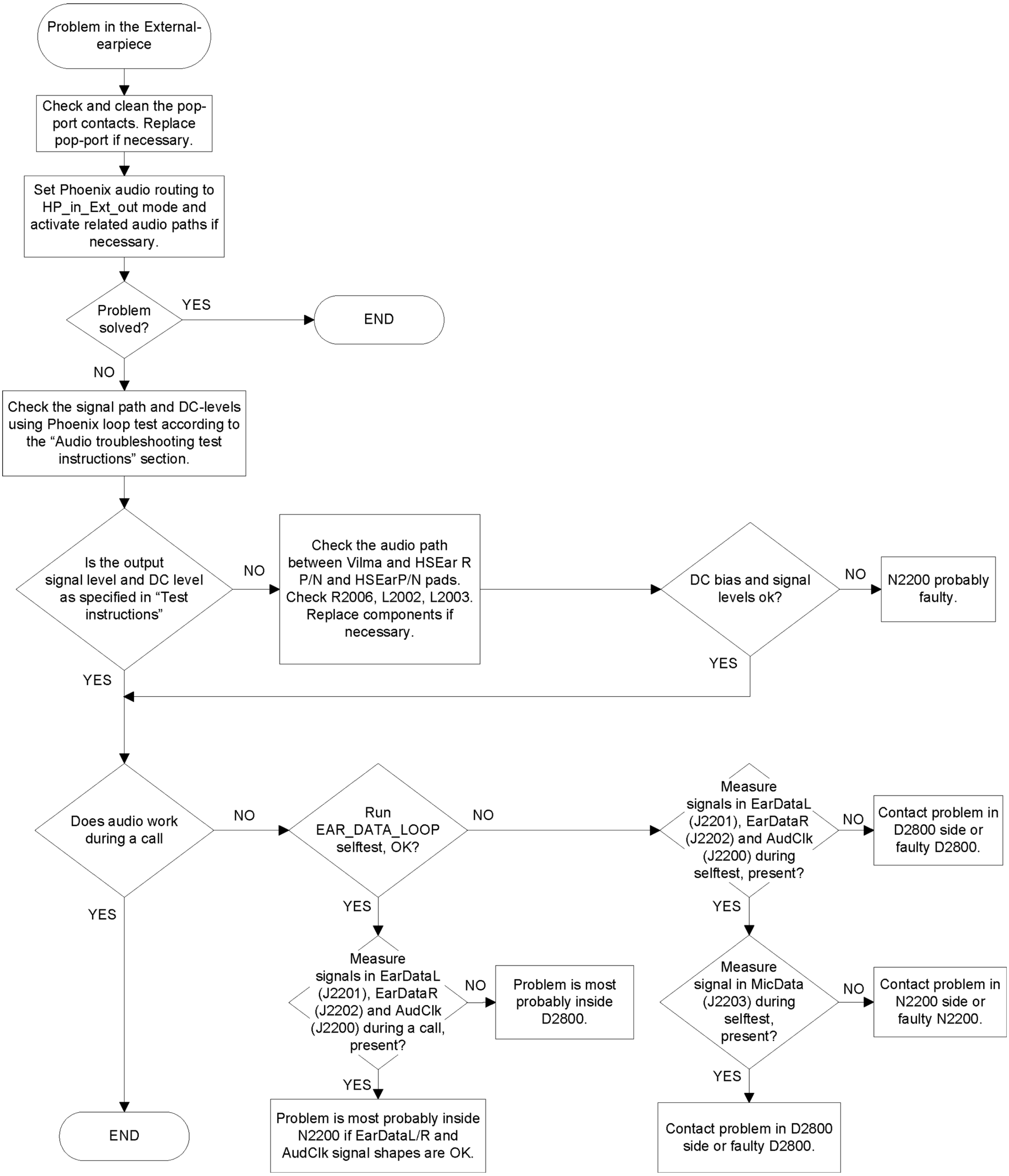
IHF troubleshooting

Troubleshooting flow


Problem in internal handsfree speaker
Check the speaker module and clean the PWB pads following the acoustics troubleshooting flowchart.
Set Phoenix audio routing to Ext_in_IHF_out mode and activate related audio paths if necessary.
Measure voltage from C2231 when IHF enabled is it ~VBAT?
NO
Check L2205 & C2231 (supply voltaqge path for IHF audio amplifier) and replace if necessary. Retest.
YES
Problem solved?
YES
END
NO
Is the output signal level as specified in "Test instructions"
NO
Check L2207, L2208, C2242, C2243, C2244, C2245, C2246, R2204, R2205. Check X1550 and its counterpart and also whole 1YE FPC in case of broken traces or faulty components. Replace if necessary. Retest.
Levels OK?
NO
Measure signals from PMARP and PMARN, present?
NO
Contact problem in D2800 side or faulty D2800.
YES
Contact problem in N2200 side or faulty N2200.
YES
YES
Does audio work during a call
NO
Probably faulty D2800.
YES
END

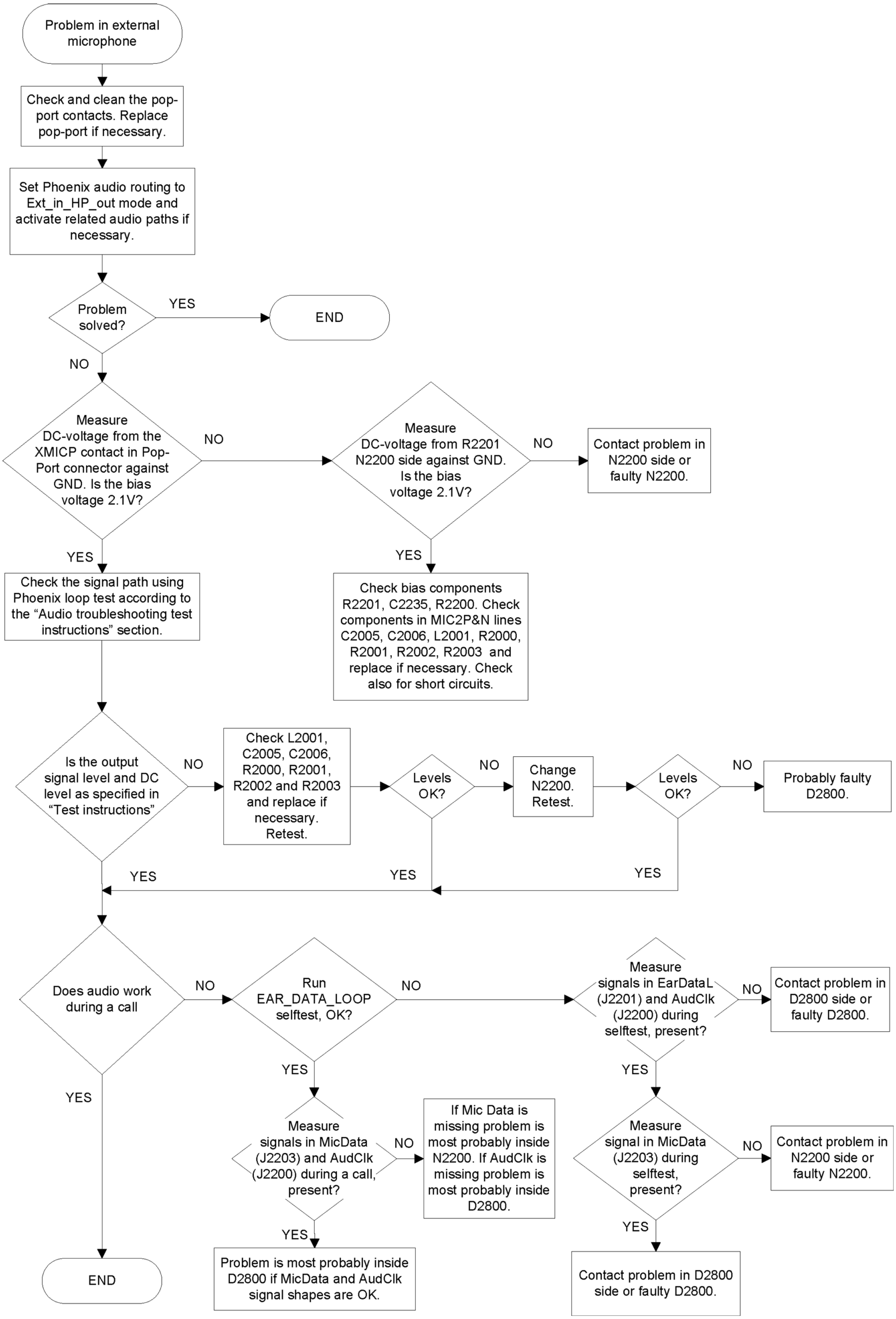
External earpiece troubleshooting

Troubleshooting flow


Problem in the External-earpiece
Check and clean the pop-port contacts. Replace pop-port if necessary.
Set Phoenix audio routing to HP_in_Ext_out mode and activate related audio paths if necessary.
Problem solved?
YES
END
NO
Check the signal path and DC-levels using Phoenix loop test according to the “Audio troubleshooting test instructions” section.
Is the output signal level and DC level as specified in “Test instructions”
NO
Check the audio path between Vilma and HSEar R P/N and HSEarP/N pads. Check R2006, L2002, L2003. Replace components if necessary.
DC bias and signal levels ok?
NO
N2200 probably faulty.
YES
YES
Does audio work during a call
NO
Run EAR_DATA_LOOP selftest, OK?
NO
Measure signals in EarDataL (J2201), EarDataR (J2202) and AudClk (J2200) during selftest, present?
NO
Contact problem in D2800 side or faulty D2800.
YES
YES
YES
Measure signals in EarDataL (J2201), EarDataR (J2202) and AudClk (J2200) during a call, present?
NO
Problem is most probably inside D2800.
Measure signal in MicData (J2203) during selftest, present?
NO
Contact problem in N2200 side or faulty N2200.
YES
YES
END
Problem is most probably inside N2200 if EarDataL/R and AudClk signal shapes are OK.
Contact problem in D2800 side or faulty D2800.

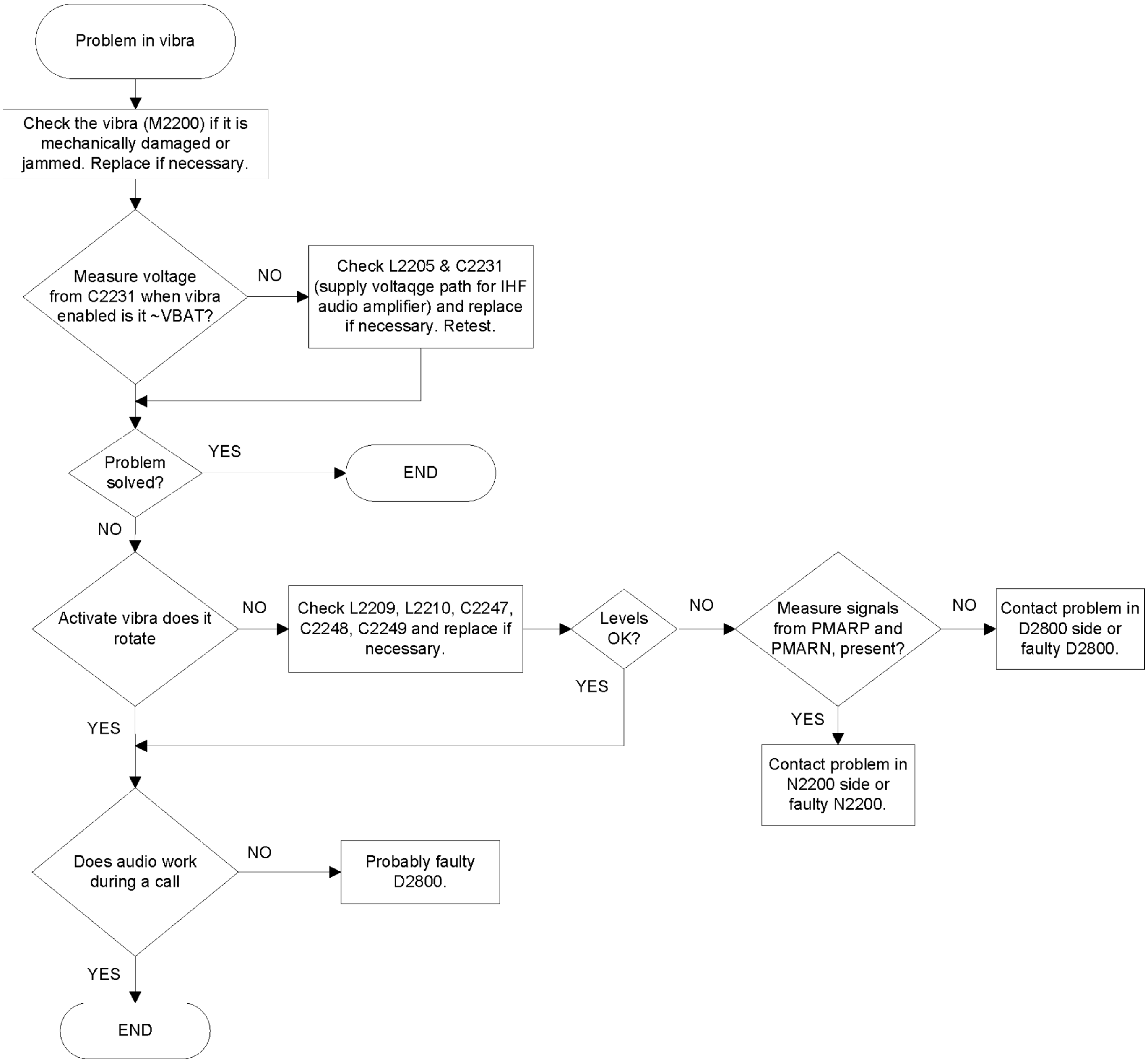
External microphone troubleshooting

Troubleshooting flow


Problem in external microphone
Check and clean the pop-port contacts. Replace pop-port if necessary.
Set Phoenix audio routing to Ext_in_HP_out mode and activate related audio paths if necessary.
Problem solved?
YES
END
NO
Measure DC-voltage from the XMICP contact in Pop-Port connector against GND. Is the bias voltage 2.1V?
NO
Measure DC-voltage from R2201 N2200 side against GND. Is the bias voltage 2.1V?
NO
Contact problem in N2200 side or faulty N2200.
YES
Check bias components R2201, C2235, R2200. Check components in MIC2P&N lines C2005, C2006, L2001, R2000, R2001, R2002, R2003 and replace if necessary. Check also for short circuits.
YES
Check the signal path using Phoenix loop test according to the "Audio troubleshooting test instructions" section.
Is the output signal level and DC level as specified in "Test instructions"
NO
Check L2001, C2005, C2006, R2000, R2001, R2002 and R2003 and replace if necessary. Retest.
Levels OK?
NO
Change N2200. Retest.
Levels OK?
NO
Probably faulty D2800.
YES
YES
YES
Does audio work during a call
NO
Run EAR_DATA_LOOP selftest, OK?
NO
Measure signals in EarDataL (J2201) and AudClk (J2200) during selftest, present?
NO
Contact problem in D2800 side or faulty D2800.
YES
Measure signal in MicData (J2203) during selftest, present?
NO
Contact problem in N2200 side or faulty N2200.
YES
Contact problem in D2800 side or faulty D2800.
YES
Measure signals in MicData (J2203) and AudClk (J2200) during a call, present?
NO
If Mic Data is missing problem is most probably inside N2200. If AudClk is missing problem is most probably inside D2800.
YES
Problem is most probably inside D2800 if MicData and AudClk signal shapes are OK.
YES
END

Vibra troubleshooting

Troubleshooting flow


Problem in vibra
Check the vibra (M2200) if it is mechanically damaged or jammed. Replace if necessary.
Measure voltage from C2231 when vibra enabled is it ~VBAT?
NO
Check L2205 & C2231 (supply voltaqge path for IHF audio amplifier) and replace if necessary. Retest.
Problem solved?
YES
END
NO
Activate vibra does it rotate
NO
Check L2209, L2210, C2247, C2248, C2249 and replace if necessary.
Levels OK?
NO
Measure signals from PMARP and PMARN, present?
NO
Contact problem in D2800 side or faulty D2800.
YES
YES
Contact problem in N2200 side or faulty N2200.
YES
Does audio work during a call
NO
Probably faulty D2800.
YES
END

Baseband manual tuning guide

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.

- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 10 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

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7 — RF Troubleshooting and Manual Tuning Guide

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Introduction to RF troubleshooting

Soldered metal shieldings and components below them are not allowed to be changed or removed. The purpose of the following troubleshooting document is only to identify possible RF faults and advice how to tune the phone if it is necessary.

All measurements should be done using:

- spectrum analyser with a high-frequency high-impedance passive probe (LO-/reference frequencies and RF power levels)
- oscilloscope with a 10:1 probe (DC-voltages and low frequency signals)

> **Caution:** A mobile phone WCDMA transmitter should never be tested with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in wide area. WCDMA Tx measurements should be performed at least in an RF-shielded box and never with higher Tx power level than 0 dBm! Test full WCDMA Tx power only in RF-shielded environment.
>
> Also all measurements with an RF coupler should be performed in RF shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, it should be checked that there are no transmissions on the same frequencies as used in the tests.

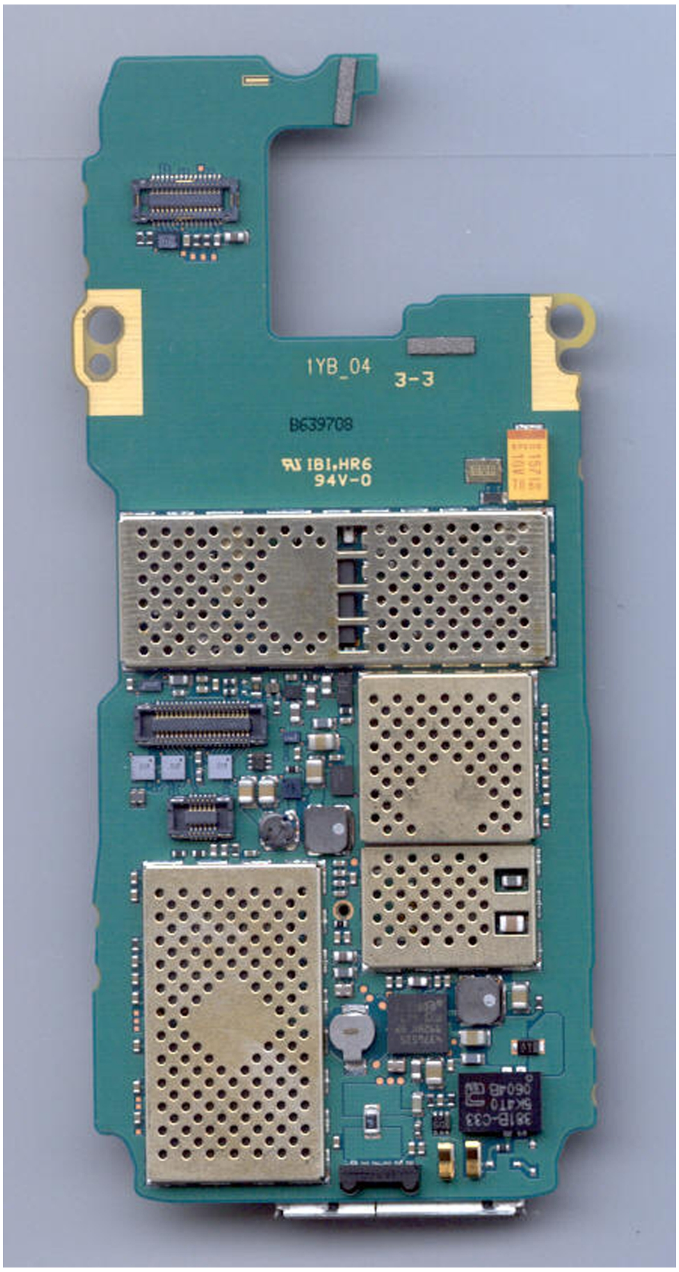
The RF section of the phone is built around one RF ASIC N7505. There are also GSM TXFEM (integrated PA and front end module) N7520 and WCDMA PA N7540 on board.

The WCDMA PA needs variable supply voltage to work properly, and therefore there is a switched mode power supply component added to the PWB (N7541).

Most RF semiconductors are static discharge sensitive. ESD protection must be taken care of during repair (ground straps and ESD soldering irons). The RF ASICs, both PAs and SMPS are moisture sensitive, so parts must be pre-baked prior to soldering.

Troubleshooting test point locations PWB top and bottom

RM-208 PWB top



RM-208 PWB bottom

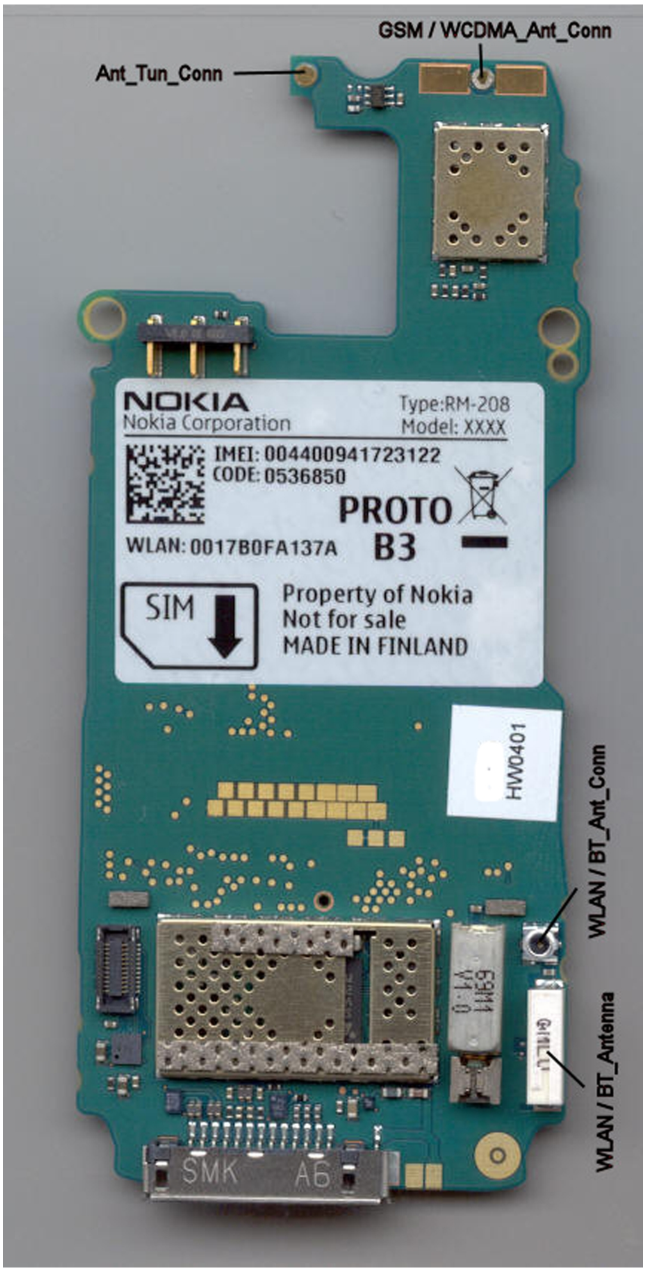

GSM / WCDMA_Ant_Conn
Ant_Tun_Conn
WLAN / BT_Ant_Conn
WLAN / BT_Antenna

Table 11 GSM TXFEM / Antenna load switch CONTROL

Vgain GMSK=0 EDGE=1	GSM850		GSM900		GSM1800		GSM1900	
	RX	TX	RX	TX	RX	TX	RX	TX
VC1_TXFEM	0	1	0	1	0	1	0	1
VC2_TXFEM	0	0	0	0	1	1	1	1
VC3_TXFEM	1	1	0	1	0	1	1	1
RFC4	1	1	0	0	0	0	1	1
RFC9	0	0	1	1	1	1	0	0

Control logic levels 0 = 0 V and 1 = 2.8 V measured with oscilloscope. Mode selections through **Testing -> GSM -> RF Controls**.

Receiver troubleshooting

Introduction to Rx troubleshooting

Rx can be tested by making a phone call or in local mode. For the local mode testing, use the Phoenix service software.

The primary Rx troubleshooting parameter is RSSI (Received Signal Strength Indicator). For GSM RSSI measurement, see GSM Rx chain activation for manual measurements / GSM RSSI measurement (page), and for the same measurement in WCDMA, see WCDMA RSSI measurement (page).

In GSM, the input signal can be either a real GSM signal or a CW (Continuous Wave) signal, which is 67.771 kHz above the carrier frequency.

In WCDMA, the input signal can be either a real WCDMA signal or a CW signal, which is 1 MHz above the carrier frequency.

For service tool usage instructions, refer to the section **Service Tools and Service Concepts**.

Related information

- WCDMA Rx chain activation for manual measurement (page 7–9)

GSM Rx chain activation for manual measurements / GSM RSSI measurement

Context

RSSI signal measurement is the main Rx troubleshooting measurement. The test measures the strength of the received signal.

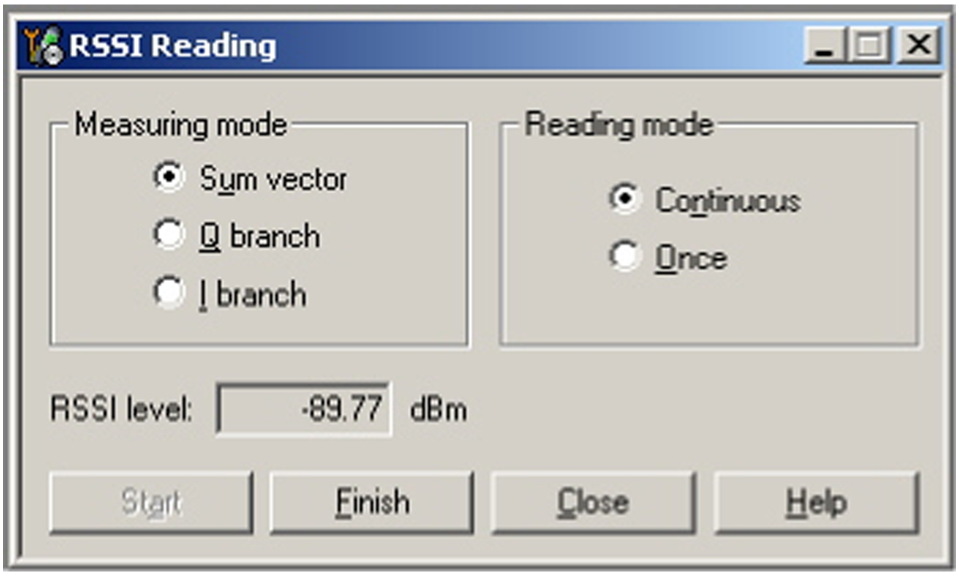
I and Q branches can be measured separately. In GSM, the input signal can be either real GSM signal or a CW (Continuous Wave) signal that is 67.771 kHz above the carrier frequency.

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→GSM→RSSI Reading** .
3. Set the RF signal generator for channel frequency +67.771 kHz CW mode with –90 dBm signal.

   Alternatively set the cellular tester downlink channel to the appropriate channel. Make sure that the tester is set to continuous mode, not to burst mode.

4. In the *RSSI Reading* window, select the appropriate band and channel.


RSSI Reading
Measuring mode
● Sum vector
○ Q branch
○ I branch
Reading mode
● Continuous
○ Once
Start
Finish
Close
Help

RSSI level: -89.77 dBm

Figure 40 ***RSSI Reading*** **window**

5. To start the measurement, activate GSM Rx chain, click **Start**.

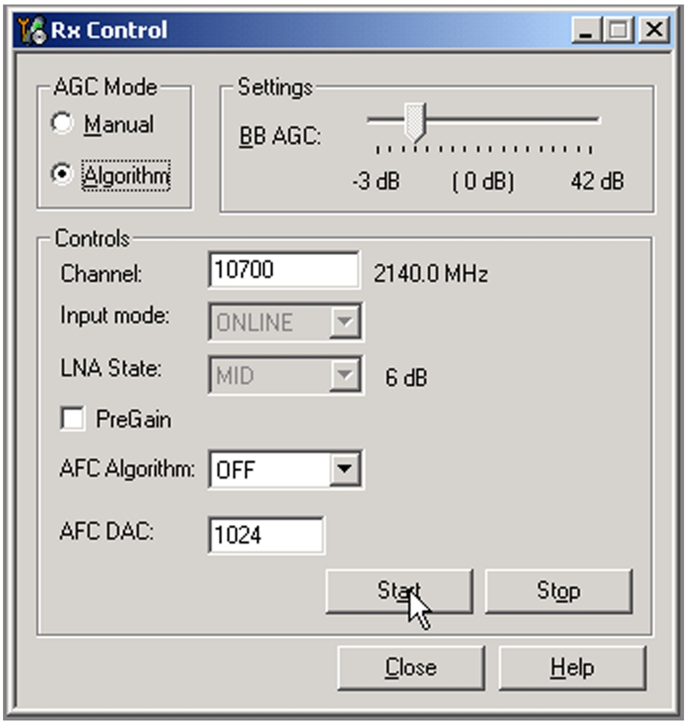
Results

RSSI reading values of the selected band and channel are displayed. The RSSI level must be the same value which is set at the signal generator (-90 dBm).

WCDMA Rx chain activation for manual measurement

Steps

1. Start *Phoenix* service software.
2. Choose **Testing**→**WCDMA**→**Rx Control** .
3. In the *Rx Control* window:



Rx Control

AGC Mode
○ Manual
● Algorithm

Settings
BB AGC: -3 dB (0 dB) 42 dB

Controls
Channel: 10700 2140.0 MHz
Input mode: ONLINE
LNA State: MID 6 dB
☐ PreGain
AFC Algorithm: OFF
AFC DAC: 1024

Figure 41 ***Rx Control*** **window**

- Set **AGC Mode** to **Algorithm**.
- Set **Channel** to **10700**.
- Set **AFC Algorithm** to **OFF** (Default = **OFF**).

Next actions

When settings are ready, click **Start** to activate them.

If settings are changed later on (for example, you give a new channel number), you will need to click **Stop** and **Start** again.

> **Note:** Clicking **Stop** also disables **Tx Control** if that was active!

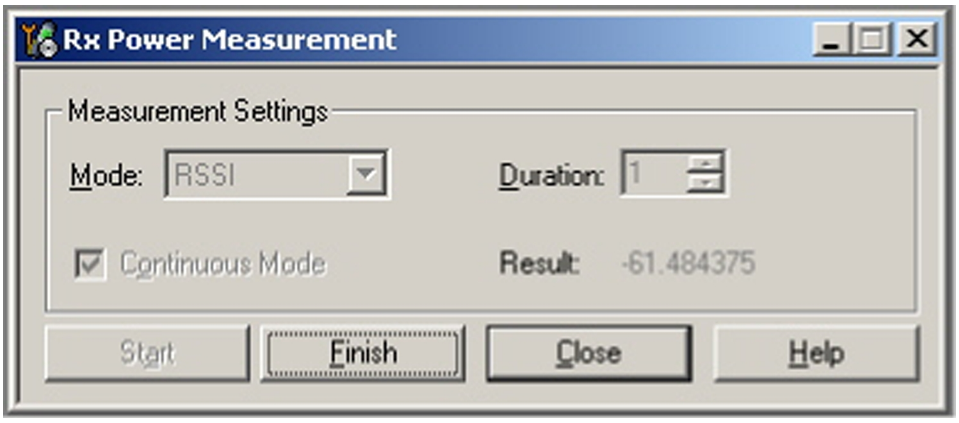
WCDMA RSSI measurement

Prerequisites

WCDMA Rx must be activated before RSSI can be measured. See WCDMA Rx chain activation for manual measurement (page 7–9).

Steps

1. Start *Phoenix* service software.
2. Choose **Testing→WCDMA→Rx Power Measurement** .
3. Set RF signal: CW signal 1 MHz above the carrier frequency OR real WCDMA signal with -60 dBm level.
4. In the *Rx Power Measurement* window, choose the following settings:
   - Mode: RSSI
   - Continuous Mode



Mode: RSSI

Duration: 1

☑ Continuous Mode

Result: -61.484375

Figure 42 RSSI reading window (WCDMA)

5. To perform the measurement, click **Start**.

Results

RSSI reading value of the selected channel is displayed.

Transmitter troubleshooting

General instructions for Tx troubleshooting

Context

- Tx troubleshooting requires Tx operation.
- Do not transmit on frequencies that are in use!
- Transmitter can be controlled in the local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is "RF Controls"; in WCDMA transmitter testing the best tool is "Tx Control".
- Tx IQ tuning and Tx power tuning can be also used in some cases.
- Remember that retuning is not a fix! Phones are tuned correctly in production.

The first set of steps instructs how to assemble the test setup. This setup is general for all Tx troubleshooting tasks.

Alternative steps provide specific troubleshooting instructions for *Phoenix* service software. The first section is for the GSM850/EGSM900/GSM1800/GSM1900 bands and the latter for WCDMA.

> **Caution:** Never activate the GSM or WCDMA transmitter without a proper antenna load. There should be always 50 ohm load connected to the RF connector (antenna, RF-measurement equipment or at least 2 watts dummy load), otherwise GSM or WCDMA PA may be damaged.

Steps

1. Connect a test jig to a computer with a DAU-9S cable or to a FPS-10 flash prommer with a modular cable.

   Make sure that you have a PKD-1 dongle connected to the computer's parallel port.
2. Connect a DC power supply to a product-specific module jig.

   > **Note:** When repairing or tuning a transmitter, use an external DC supply with at least 3 A current capability.
   >
   > Set the DC supply voltage to 12V and set the CU-4 voltage to 3.7V from Phoenix: **Tools** -> **CU4/ Terminal current consumption**. Move voltage bar in the window to value 3.7V.
3. Connect an RF cable between the RF connector of the product-specific module test jig and measurement equipment or alternatively use a 50 ohms (at least 2 W) dummy load in the module test jig RF connector, otherwise GSM or WCDMA PA may be damaged.

Note: There are two antenna connectors in the module jig:

- one for GSM/WCDMA
- one for Bluetooth and WLAN

Make sure that all connections are made to the correct RF connector.

Normally a spectrum analyser is used as measurement equipment.

Note: The maximum input power of a spectrum analyser is +30 dBm.

To prevent any damage, it is recommended to use 10 dB attenuator on the spectrum analyzer input.

4. Set Tx on.

   i Set the phone module to the test jig and start *Phoenix service software*.

   ii Initialize connection to the phone. (With FPS-10 use FBUS driver when using DAU-9S and COMBOX driver).

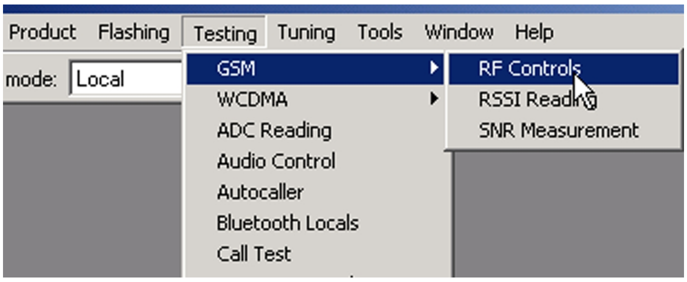
   iii From the File menu, choose product: **File -> Choose Product -> xx-x*** (* = type designator of the phone).

   iv From the toolbar, set Operating mode to "Local".

Alternative steps

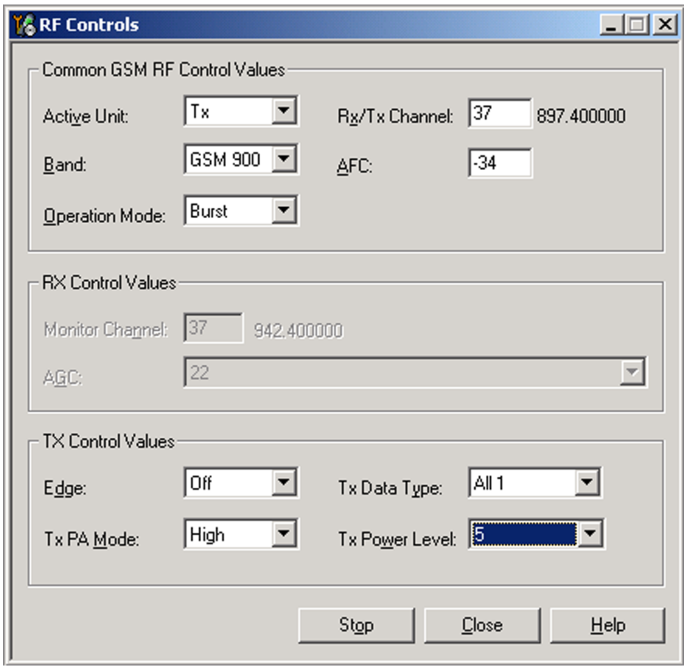
- GSM850/EGSM900/GSM1800/GSM1900 troubleshooting

  i From the Testing menu, activate the *RF Controls* window: **Testing -> GSM -> RF Controls** .


Product
Flashing
Testing
Tuning
Tools
Window
Help
mode:
Local
GSM
WCDMA
ADC Reading
Audio Control
Autocaller
Bluetooth Locals
Call Test
RF Controls
RSSI Reading
SNR Measurement

  ii In the *RF Controls* window:

  - Select band "GSM850" or "GSM900" or "GSM1800" or "GSM1900" (Default = "GSM900").
  - Set Active unit to "Tx" (Default = "Rx").
  - Set Operation mode to "Burst" (Default = "Burst").
  - Set Tx data type to "All1" (Default = "All1").
  - Set Rx/Tx channel to 190 on GSM850 or 37 on GSM900 band or 700 on GSM1800 band or 661 on GSM1900 (Defaults).
  - Set Edge to "Off" (Default).
  - Set Tx PA mode to "Free" (Default).
  - Set power level to 5 (Default = 19) on GSM850/GSM900 or to 0 (Default = 15) on GSM1800/GSM1900.


RF Controls
Stop
Close
Help

Common GSM RF Control Values

Active Unit: Tx

Rx/Tx Channel: 37 897.400000

Band: GSM 900

AFC: -34

Operation Mode: Burst

RX Control Values

Monitor Channel: 37 942.400000

AGC: 22

TX Control Values

Edge: Off

Tx Data Type: All 1

Tx PA Mode: High

Tx Power Level: 5

Figure 43 RF Controls window

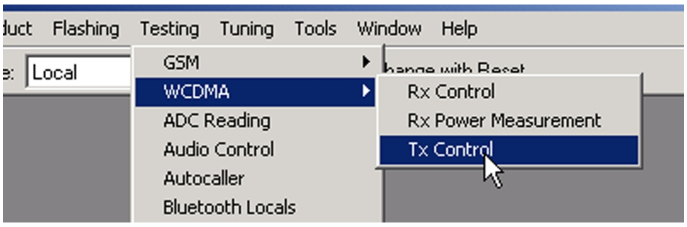
GSM TX output power measurement

Power meter or spectrum analyzer is used for power measurement. Spectrum analyzer settings see section “Tx power level tuning (GSM)”.

Power level value (dBm) for selected band and power level is read from the measurement equipment.

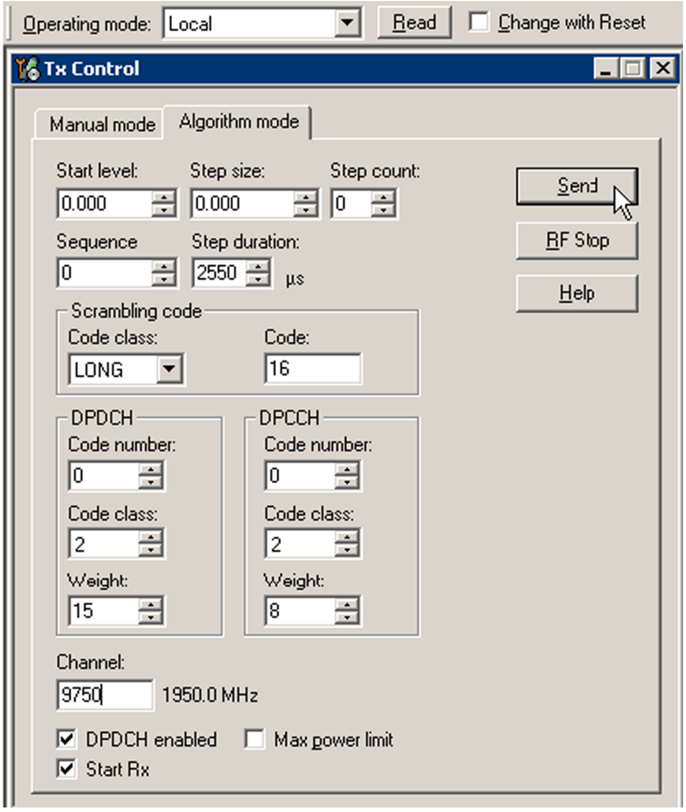
- WCDMA troubleshooting

i From the Testing menu, activate the *Tx Control* window: **Testing -> WCDMA -> Tx Control** .


luct
Flashing
Testing
Tuning
Tools
Window
Help
e: Local
GSM
WCDMA
ADC Reading
Audio Control
Autocaller
Bluetooth Locals
hange with Reset
Rx Control
Rx Power Measurement
Tx Control

ii In the *Tx Control* window:

- Select the *Algorithm mode* tab.
- Set Start level to “0” dBm (Default = “0”).
- Set Step size, Step count and Sequence to “0” (Default = “0”).
- Set Scrambling code class to “LONG” (Default = “LONG”).
- Set Scrambling code to “16” (Default = “16”).
- Set DPDCH Code number to “0”, Code class to “2” and Weight to “15” (Defaults).
- Set DPCCH Code number to “0”, Code class to "2" and Weight to “8” (Defaults).
- Set Channel to 9750.
- Check the "DPDCH enabled" checkbox (Default).


Read
Manual mode
Algorithm mode
Send
RF Stop
Help

Operating mode: Local

☐ Change with Reset

Tx Control

Start level: 0.000

Step size: 0.000

Step count: 0

Sequence 0

Step duration: 2550 µs

Scrambling code

Code class: LONG

Code: 16

DPDCH

Code number: 0

Code class: 2

Weight: 15

DPCCH

Code number: 0

Code class: 2

Weight: 8

Channel: 9750 1950.0 MHz

☑ DPDCH enabled ☐ Max power limit

☑ Start Rx

Figure 44 Tx Control window

Next actions

When settings are done, click “Send” to enable them.

If you change the settings (e.g. give a new channel number), you need to click “Stop” and “Send” again.

Checking antenna functionality

The main antenna has one antenna element: GSM and WCDMA.

In the GSM/WCDMA antenna, there is one Feed and two GND contacts.

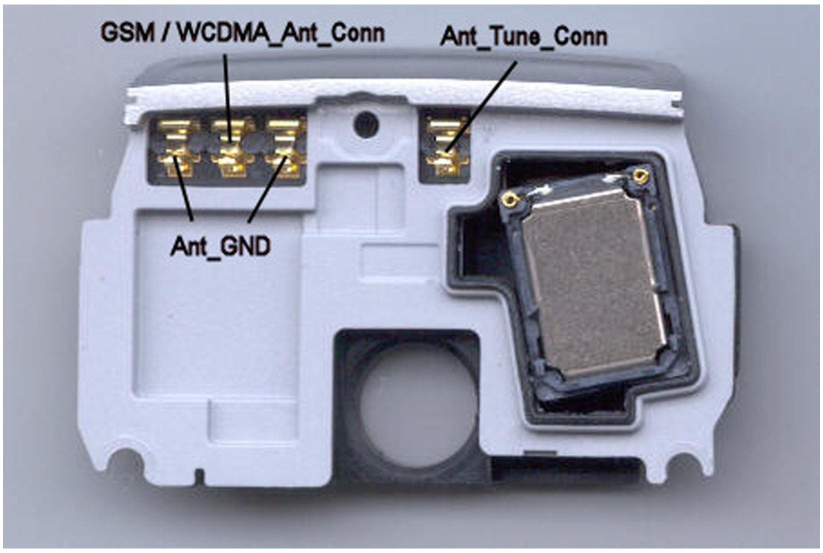

GSM / WCDMA_Ant_Conn
Ant_Tune_Conn
Ant_GND

Figure 45 RM-208 antenna

BT / WLAN antenna is a discrete component on the PWB.

RF tunings

Introduction to RF tunings

Phone RF is tuned in production. There is no reason to do the re-calibration unless:

- FLASH memory chip is corrupted.

> **Note:** RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase will cause a complete mistuning of the RF side.
>
> **Important:** **Always** use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken into account when the phone is tuned. As all the RF losses are frequency dependent, the user have to be very careful and understand the measurement setup. The following table presents the RF attenuations of the product-specific module jig:

Table 12 Attenuation values for galvanic RF connection Module Jig MJ-120

Band	Tuning Channel	Attenuation RX	Tolerance RX	Attenuation TX	Tolerance TX
GSM 850	190	-0.1	+/- 0.1	-0.1	+/- 0.1
GSM 900	37	-0.2	+/- 0.1	-0.1	+/- 0.1
GSM 1800	700	-0.5	+/- 0.1	-0.6	+/- 0.1
GSM 1900	661	-0.5	+/- 0.1	-0.5	+/- 0.1
WCDMA 2100	9750/10700	-0.6	+/- 0.1	-0.5	+/- 0.1

RF autotuning

RF autotuning

Prerequisites

For information on the recommended test set-up, refer to the corresponding information on the Partner Website or Nokia Online.

Before you can use the autotuning feature, the GPIB driver from the GPIB card vendor must be installed and running.

The file used in autotuning must be in a correct place: **C:\Program Files\Nokia\Phoenix\products\xx-x*\rfconf_xx-x*.xml** (**= indicates the type designator of the phone, e.g. RM-208*)

Context

RF autotuning is performed with the aid of a digital radio communication tester.

Autotuning covers all RF tunings that are needed to perform after RF component repairs.

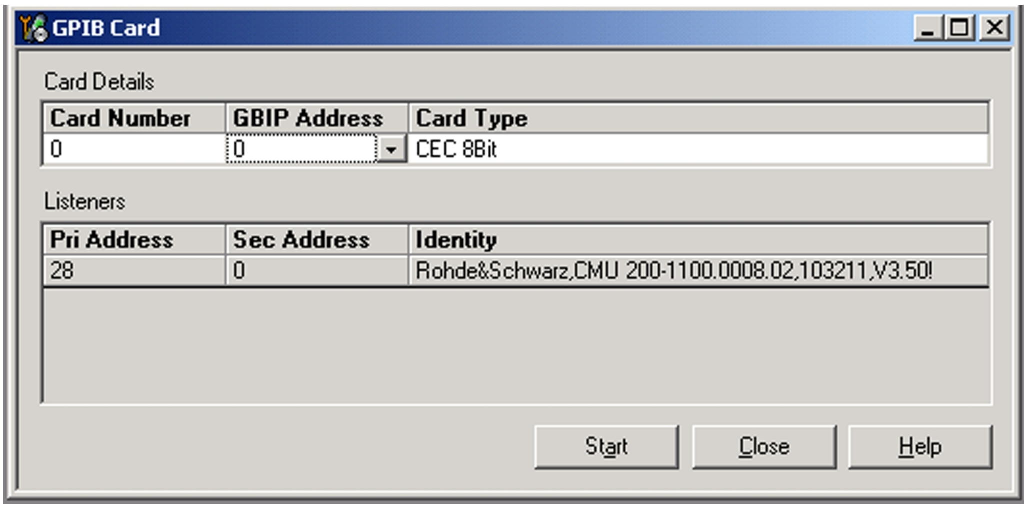
> **Note:** Do not perform RF autotuning without a proper reason. Autotuning may only be performed after component repairs or if the RF tuning information is lost.

Steps

1. Connect the communication tester to the GPIB bus.

2. Start *Phoenix* service software.
3. Choose **Tools→Options→GPIB Card.**
4. From the **Card Type** drop-down menu, choose the GPIB card used, then click **Start**.

   The name of the communication tester appears in the **Listeners** pane.



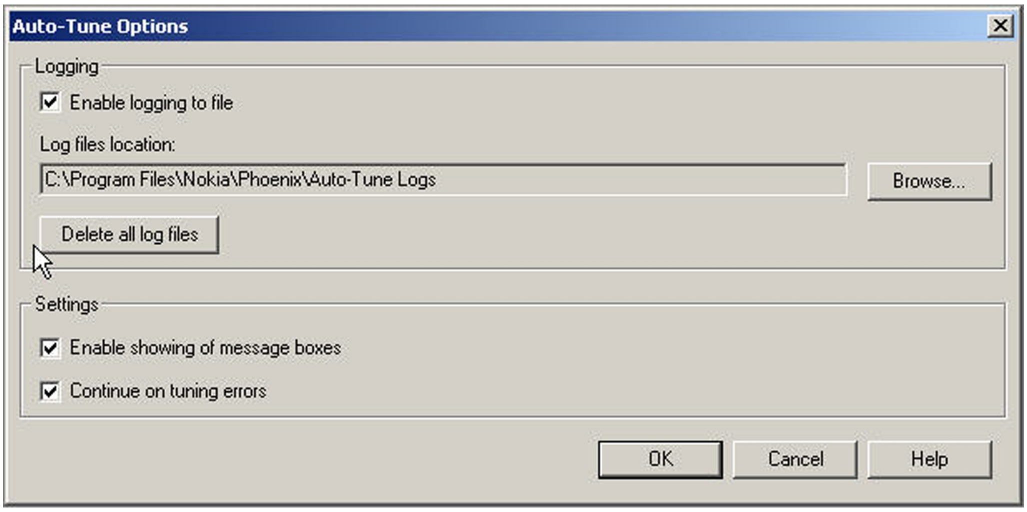
Card Details

Card Number	GBIP Address	Card Type
0	0	CEC 8Bit

Listeners

Pri Address	Sec Address	Identity
28	0	Rohde&Schwarz,CMU 200-1100.0008.02,103211,V3.50!

5. To start autotuning, choose **Auto-Tune** from the **Tuning** menu.
6. In the *Auto-Tune* window, click **Options**.
7. In the *Auto-Tune options* window, ensure the **Enable showing of message boxes** check box is checked, and click **OK**.



Logging

☑ Enable logging to file

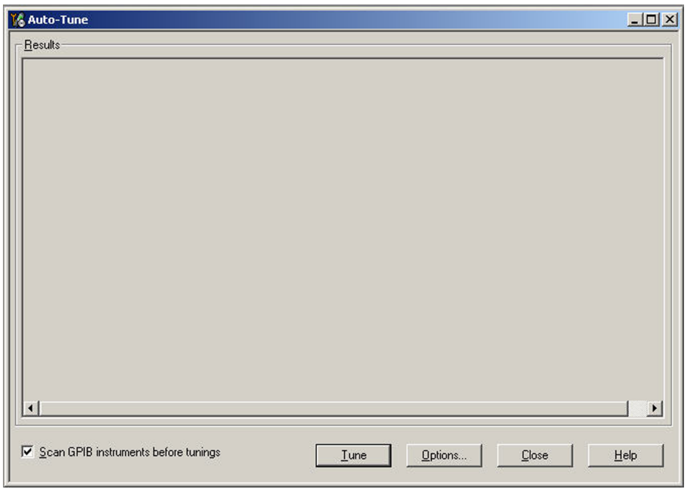
Log files location: C:\Program Files\Nokia\Phoenix\Auto-Tune Logs

Settings

☑ Enable showing of message boxes

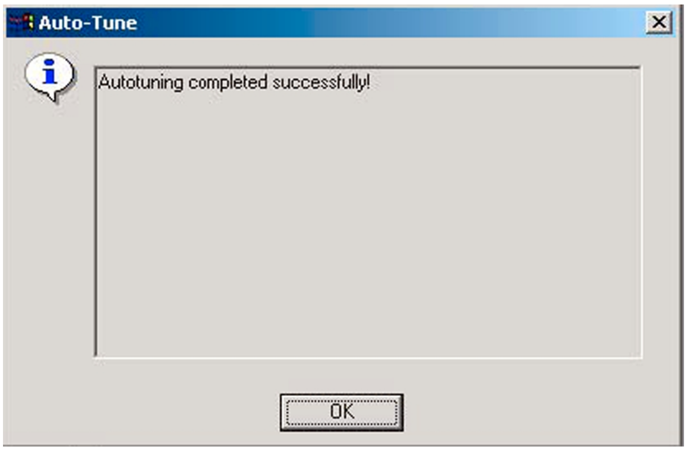
☑ Continue on tuning errors

8. Connect the phone to module jig's RF port to the communication tester, and click **Tune**.


Auto-Tune
Results
☑ Scan GPIB instruments before tunings
Tune
Options...
Close
Help

Results

Autotuning completed successfully! message appears.


Auto-Tune
OK

Autotuning completed successfully!

RF manual tuning guide

Required manual tunings after component changes

Important: After RF component changes, **always** use autotuning. Manual tunings are only required in rare cases.

System mode independent manual tunings

Rf channel filter calibration

Context

Rf channel filter calibration tunes the internal low pass filters of Rx and Tx ASICs that limit the bandwidth of BB IQ signals.

One common calibration is made for both GSM and WCDMA.

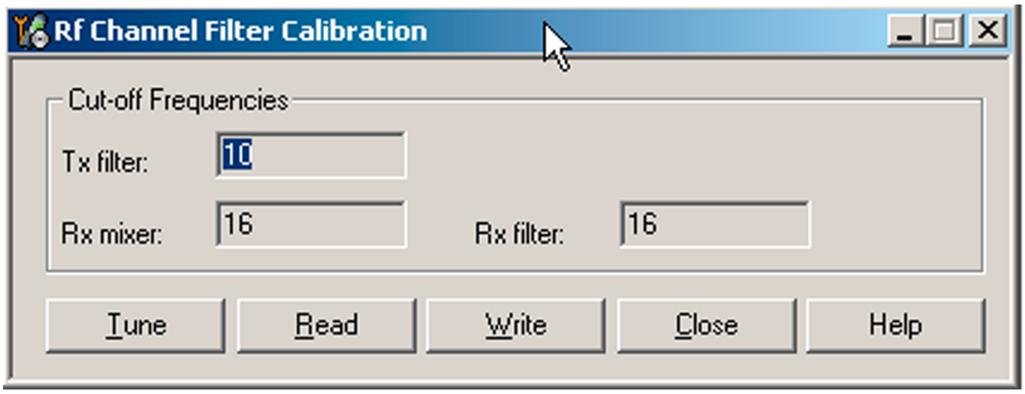
Table 13 Rf channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
Rx filter	0	16	31
Rx mixer	0	16	31

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Rf Channel Filter Calibration.**
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To end the tuning, click **Close**.

Results



Tx filter: 10
Rx mixer: 16
Rx filter: 16

Figure 46 Rf channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.
4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

Temperature sensor calibration

Context

There is a temperature sensor integrated into one of the device ASICs. The ASIC provides DC-voltage, which is temperature dependent.

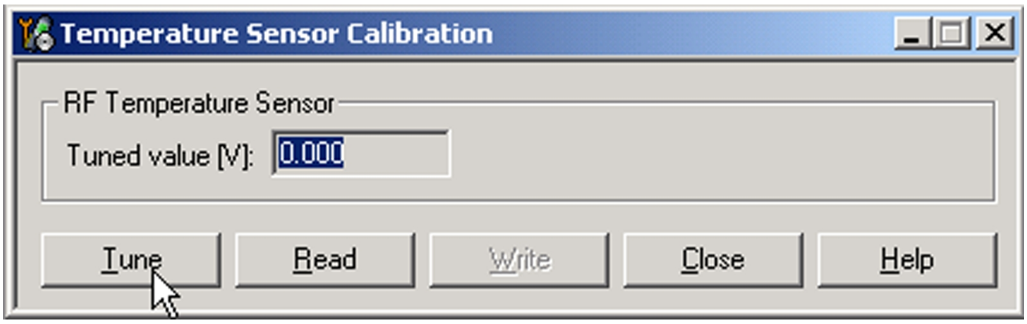
Temperature sensor calibration is done in room temperature, in which offset caused by the ASIC variation and AD-converter are nullified.

The module is able to do this calibration by itself, no external equipment is needed.

The temperature of the module and components must be 23 +/-2 degrees.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Temperature Sensor Calibration** .
3. Click **Tune**.


Temperature Sensor Calibration
RF Temperature Sensor
Tune
Read
Write
Close
Help

Tuned value [V]: 0.000

Table 14 Temperature sensor calibration tuning limits

Min	Typ	Max	Unit
-0.25	0	0.25	V

4. To save the calibration values, click **Write**.
5. To finish the calibration, click **Close**.

GSM receiver tunings

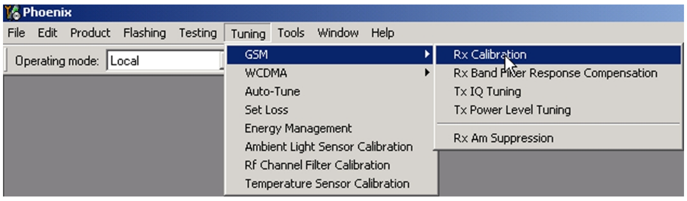
Rx calibration (GSM)

Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

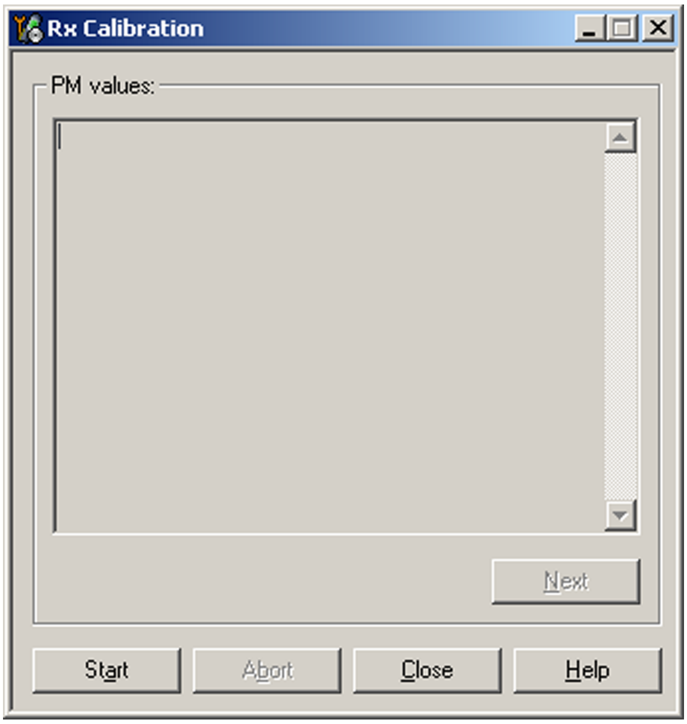
Steps

1. Connect the module jig’s GSM connector to signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx Calibration.


Phoenix
File
Edit
Product
Flashing
Testing
Tuning
Tools
Window
Help
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

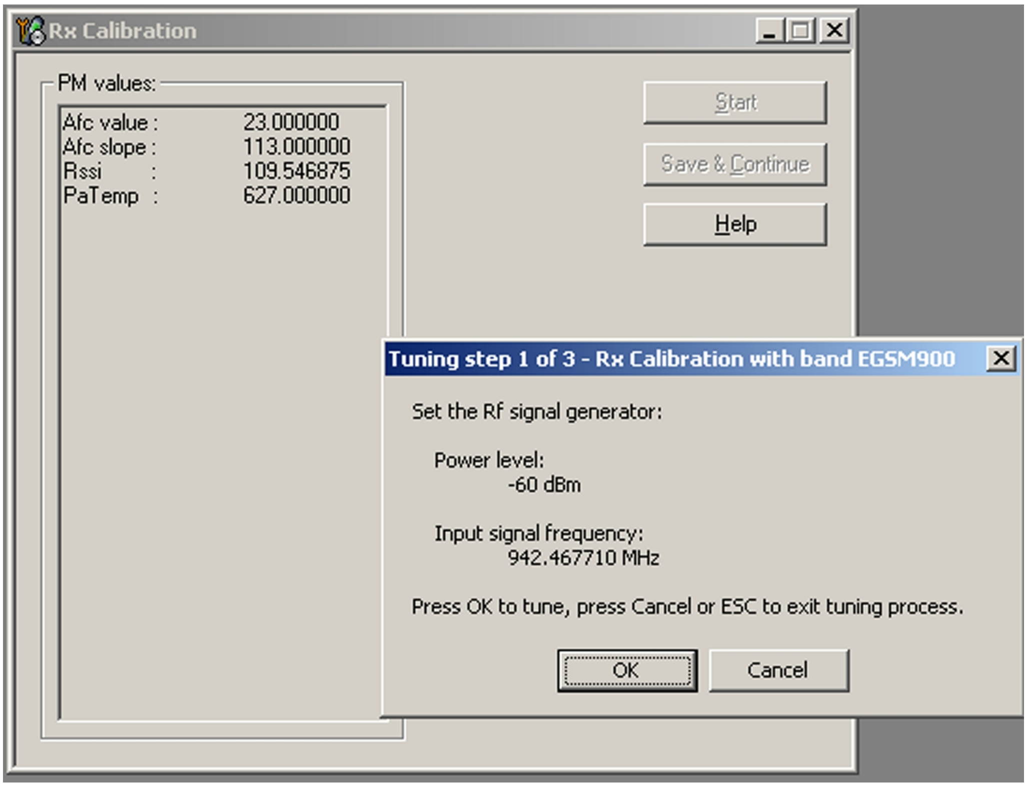
Operating mode: Local

4. Click Start (if not active already).


Rx Calibration
PM values:
Next
Start
Abort
Close
Help

5. Connect signal generator to the phone and set frequency and amplitude as instructed in the "Rx Calibration with band GSM850" popup window.

   The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation!


Rx Calibration
PM values:
Start
Save & Continue
Help
OK
Cancel

Afc value : 23.000000
Afc slope : 113.000000
Rssi : 109.546875
PaTemp : 627.000000

Tuning step 1 of 3 - Rx Calibration with band EGSM900

Set the Rf signal generator:

Power level:
-60 dBm

Input signal frequency:
942.467710 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

6. To perform tuning, click OK.

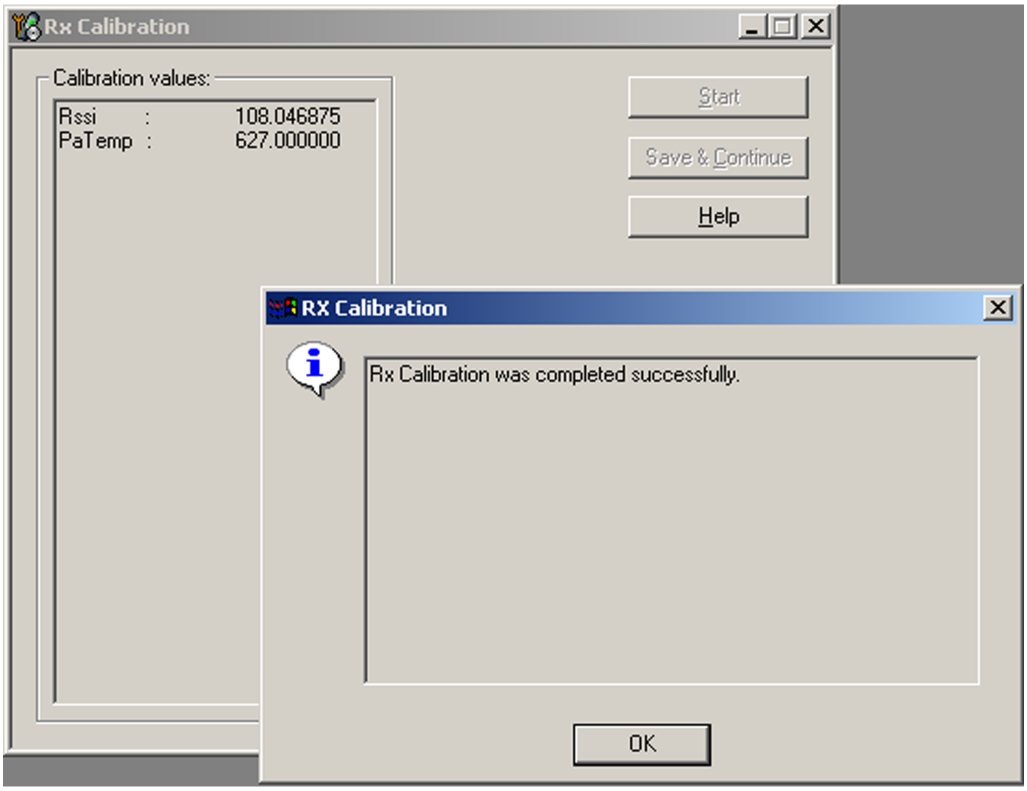
7. Check that the tuning values are within the limits specified in this table:

Table 15 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM850/GSM900				
AFC Value	-200	-105...62	200	
AFC slope	0	122	200	
RSSI0	106	107...110	114	dB
GSM1800				
RSSI0	104	104...109	114	dB
GSM1900				
RSSI0	104	104...109	114	dB

8. Go to the next band RX calibration by clicking "Next".
9. The last RX calibration is done at GSM1900 band. Click “next” after GSM1900 RX calibration and the tuning values are saved.

Results



Calibration values:
Rssi : 108.046875
PaTemp : 627.000000

Rx Calibration was completed successfully.

Rx band filter response compensation (GSM)

Prerequisites

Rx Calibration must be performed before the Rx Band Filter Response Compensation.

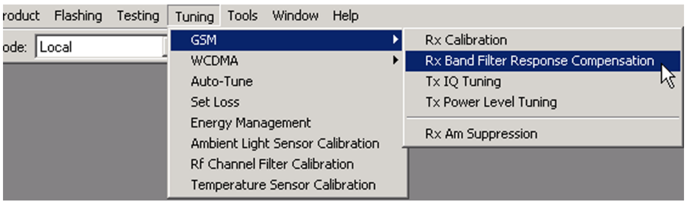
Context

On each GSM Rx band, there is a bandbass filter in RF asic. The amplitude ripple caused by these filters causes ripple to the RSSI measurement and therefore calibration is needed.

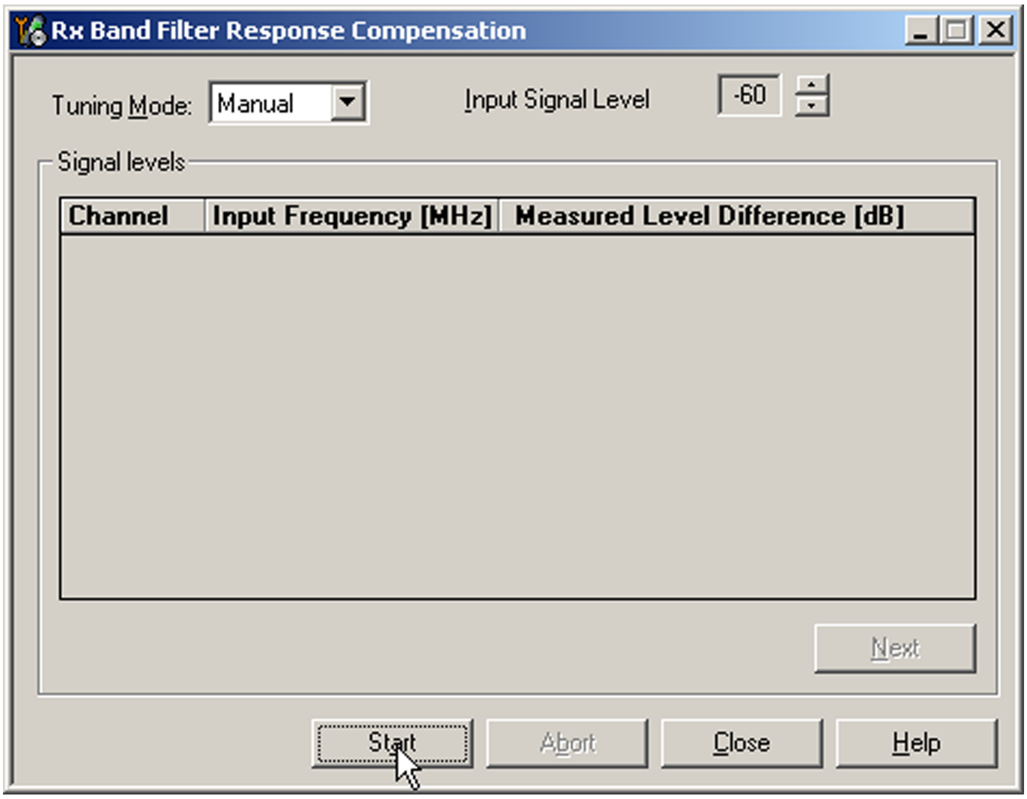
The calibration has to be repeated for each GSM band.

Steps

1. Connect the module jig’s GSM connector to the signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx Band Filter Response Compensation.


roduct
Flashing
Testing
Tuning
Tools
Window
Help
ode: Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

4. In the *Tuning mode* pane, select **Manual**.
5. Click Start.

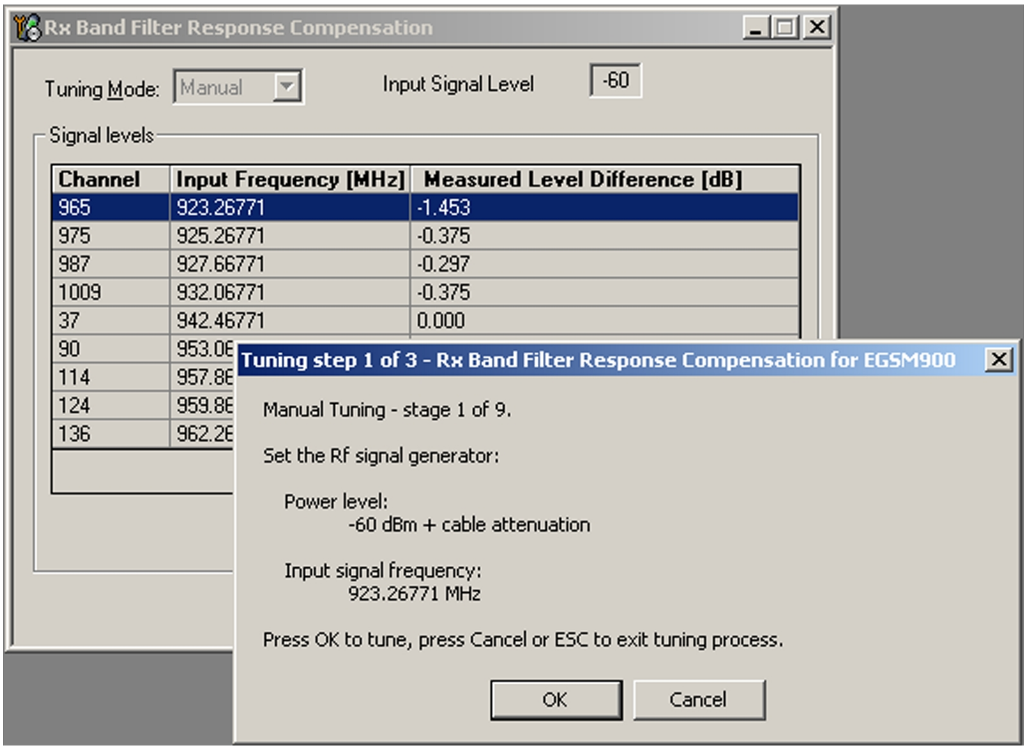

Rx Band Filter Response Compensation
Signal levels
Next
Start
Abort
Close
Help

Tuning Mode: Manual

Input Signal Level -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]

6. Connect the signal generator to the phone and set frequency and amplitude as instructed in the "Rx Band Filter Response Compensation for EGSM900" popup window.



Rx Band Filter Response Compensation
Tuning Mode: Manual
Input Signal Level -60
Signal levels

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-1.453
975	925.26771	-0.375
987	927.66771	-0.297
1009	932.06771	-0.375
37	942.46771	0.000
90	953.06	
114	957.86	
124	959.86	
136	962.26	

Tuning step 1 of 3 - Rx Band Filter Response Compensation for EGSM900

Manual Tuning - stage 1 of 9.

Set the Rf signal generator:

Power level:
-60 dBm + cable attenuation

Input signal frequency:
923.26771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

7. To perform tuning, click OK.
8. Go through all 9 frequencies.
9. Check that the tuning values are within the limits specified in the following table:

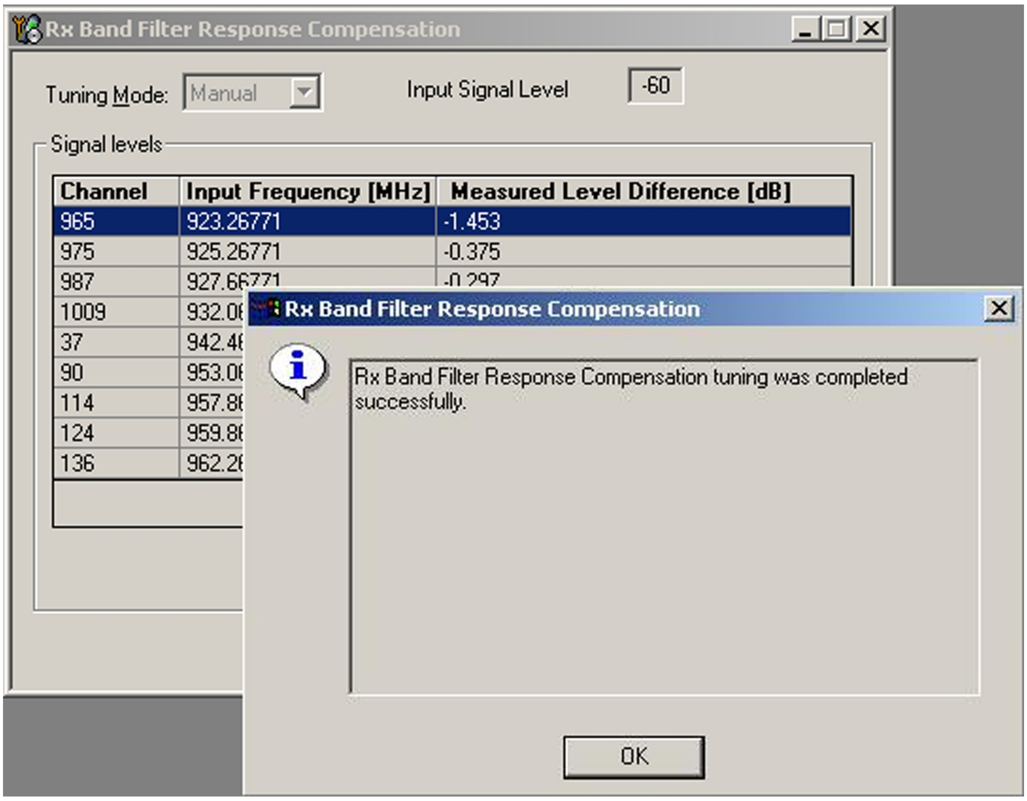
	Min	Typ	Max	Unit
GSM850/GSM900				
GSM850				
Ch.118 / 867.26771 MHz	-6	-1	2	dB
Ch.128 / 869.26771 MHz	-3	0	2	dB
Ch.140 / 871.66771 MHz	-3	0	2	dB
Ch.172 / 878.06771 MHz	-3	0	2	dB
Ch.190 / 881.66771 MHz	-3	0	2	dB
Ch.217 / 887.06771 MHz	-3	0	2	dB
Ch.241 / 891.86771 MHz	-3	0	2	dB

	Min	Typ	Max	Unit
Ch.251 / 893.86771 MHz	-3	0	2	dB
Ch.261 / 895.86771 MHz	-6	-1	2	dB
GSM900				
Ch. 965 / 923.26771 MHz	-6	-1	2	dB
Ch. 975 / 925.26771 MHz	-3	0	2	dB
Ch. 987 / 927.66771 MHz	-3	0	2	dB
Ch. 1009 / 932.06771 MHz	-3	0	2	dB
Ch. 37 / 942.46771 MHz	-3	0	2	dB
Ch. 90 / 953.06771 MHz	-3	0	2	dB
Ch. 114 / 957.86771 MHz	-3	0	2	dB
Ch. 124 / 959.86771 MHz	-3	0	2	dB
Ch. 136 / 962.26771 MHz	-6	-1	2	dB
Ch. 965 / 923.26771 MHz	-10	-1	5	dB
Ch. 975 / 925.26771 MHz	-3	0	5	dB
Ch. 987 / 927.66771 MHz	-3	0	5	dB
Ch. 1009 / 932.06771 MHz	-3	0	5	dB
Ch. 37 / 942.46771 MHz	-3	0	5	dB
Ch. 90 / 953.06771 MHz	-3	0	5	dB
Ch. 114 / 957.86771 MHz	-3	0	5	dB
Ch. 124 / 959.86771 MHz	-3	0	5	dB
Ch. 136 / 962.26771 MHz	-10	-1	5	dB

	Min	Typ	Max	Unit
GSM1800				
Ch. 497 / 1802.26771 MHz	-6	-1	3	dB
Ch. 512 / 1805.26771 MHz	-3	0	3	dB
Ch. 535 / 1809.86771 MHz	-3	0	3	dB
Ch. 606 / 1824.06771 MHz	-3	0	3	dB
Ch. 700 / 1842.86771 MHz	-3	0	3	dB
Ch. 791 / 1861.06771 MHz	-3	0	3	dB
Ch. 870 / 1876.86771 MHz	-3	0	3	dB
Ch. 885 / 1879.86771 MHz	-3	0	3	dB
Ch. 908 / 1884.46771 MHz	-6	-1	3	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-6	-1	5	dB
Ch. 512 / 1930.26771 MHz	-3	0	5	dB
Ch. 537 / 1935.26771 MHz	-3	0	5	dB
Ch. 586 / 1945.06771 MHz	-3	0	5	dB
Ch. 661 / 1960.06771 MHz	-3	0	5	dB
Ch. 736 / 1975.06771 MHz	-3	0	5	dB
Ch. 794 / 1986.66771 MHz	-3	0	5	dB
Ch. 810 / 1989.86771 MHz	-3	0	5	dB
Ch. 835 / 1994.86771 MHz	-6	-1	5	dB

10. If the values are within the limits, click "Next".
11. GSM900 tuning is automatically started. After GSM900 tuning, GSM1800 and GSM1900 tuning is followed.

Results


Rx Band Filter Response Compensation
Tuning Mode:
Manual
Input Signal Level
Signal levels
Rx Band Filter Response Compensation
OK

Input Signal Level: -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-1.453
975	925.26771	-0.375
987	927.66771	-0.297
1009	932.0	
37	942.4	
90	953.0	
114	957.8	
124	959.8	
136	962.2	

Rx Band Filter Response Compensation tuning was completed successfully.

Rx AM suppression (GSM)

Context

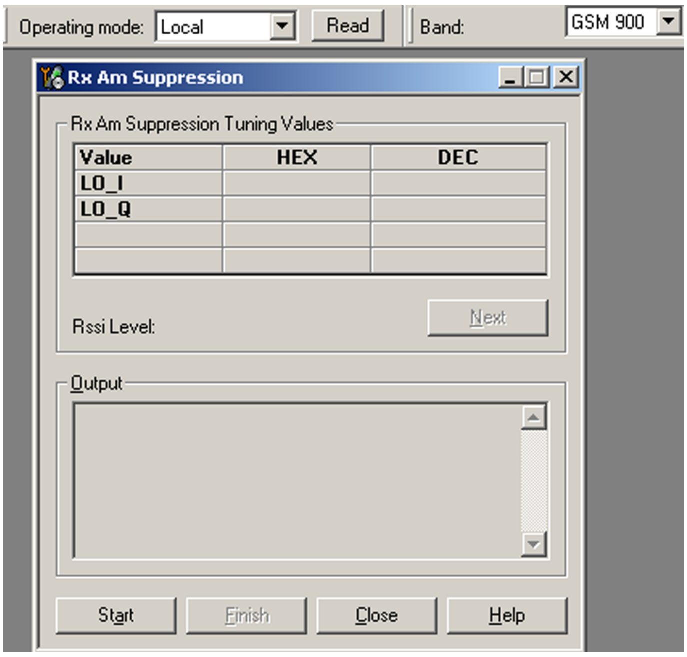
AM suppression is related to ability of the receiver to operate when there is a disturbing AM modulated signal near the received channel signal frequency.

AM suppression is not tunable, it is only a check. In Rx AM suppression, a continuous useful signal accompanied with an AM modulated signal 10 MHz above the current channel is fed to the antenna and RSSI value is read.

Steps

1. Connect the module jig’s GSM connector to the signal generator.
2. From the "Operating mode" dropdown menu, set mode to "Local".
3. From the Tuning menu, choose GSM -> Rx AM Suppression.

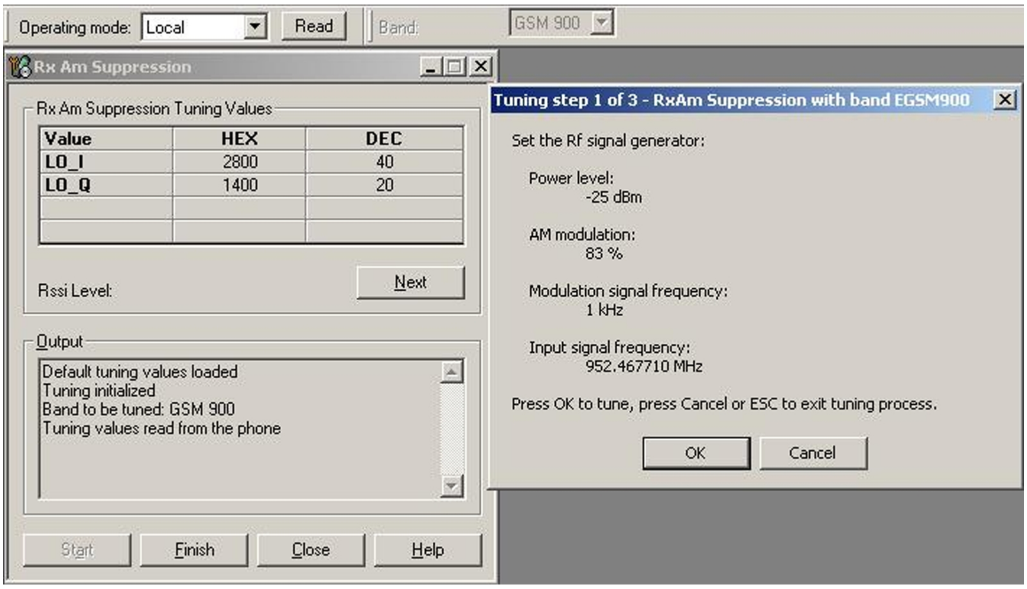
4. Click Start.


Operating mode:
Local
Read
Band:
GSM 900
Rx Am Suppression
Rx Am Suppression Tuning Values
Value
HEX
DEC
LO_I
LO_Q
Rssi Level:
Next
Output
Start
Finish
Close
Help

5. Connect the signal generator to the phone according to the frequency and modulation parameters displayed in the pop-up window:

Frequency	891.66771 MHz / 952.46771 MHz / 1852.86771 MHz / 1970.06771 MHz (depending on the band used)
Power level	-29 dBm / -29 dBm / -29 dBm / -29 dBm (increase by cable and jig attenuations)
Modulation	AM
AM modulation depth	90%
Modulation signal	50 kHz sinewave (or 15 kHz if 50 kHz is not available)

6. Click OK.



Operating mode: Local

Band: GSM 900

Rx Am Suppression

Rx Am Suppression Tuning Values

Value	HEX	DEC
LO_I	2800	40
LO_Q	1400	20

Rssi Level:

Output

```
Default tuning values loaded
Tuning initialized
Band to be tuned: GSM 900
Tuning values read from the phone
```

Tuning step 1 of 3 - RxAm Suppression with band EGSM900

Set the Rf signal generator:

Power level:
-25 dBm

AM modulation:
83 %

Modulation signal frequency:
1 kHz

Input signal frequency:
952.467710 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

7. Check that RSSI level value is between the limits presented in the following table.

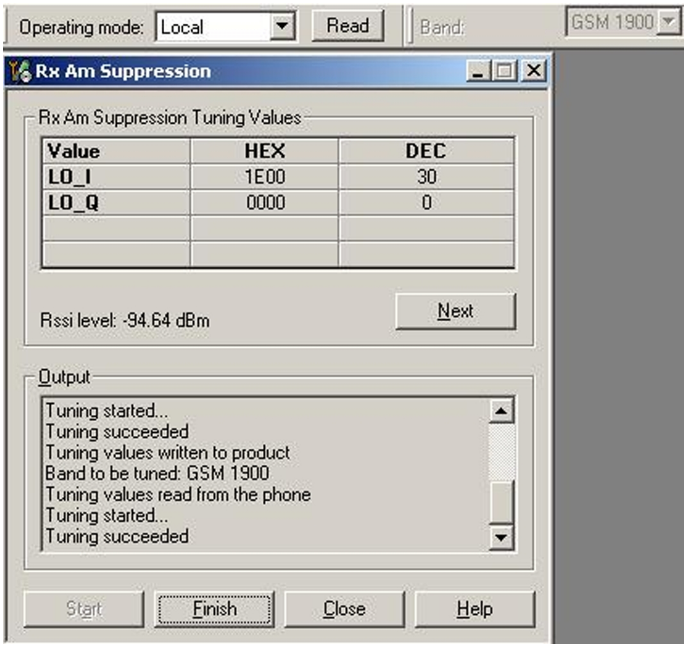
Table 16 RSSI level values

Band	Min	Max	Unit
GSM850/GSM900	-115	-95	dB
GSM1800	-115	-95	dB
GSM1900	-115	-96	dB

Note: The limit values are to be used with a low noise signal generator. If other signal generators (for example CMU200 tester or Willtek tester) are used, the limits should be higher.

8. To proceed to the next band, click "Next".

9. To end the tuning, click "Finish" and "Close".



Operating mode: Local

Band: GSM 1900

Rx Am Suppression Tuning Values

Value	HEX	DEC
LO_I	1E00	30
LO_Q	0000	0

Rssi level: -94.64 dBm

Output

```
Tuning started...
Tuning succeeded
Tuning values written to product
Band to be tuned: GSM 1900
Tuning values read from the phone
Tuning started...
Tuning succeeded
```

GSM transmitter tunings

Tx IQ selftuning (GSM)

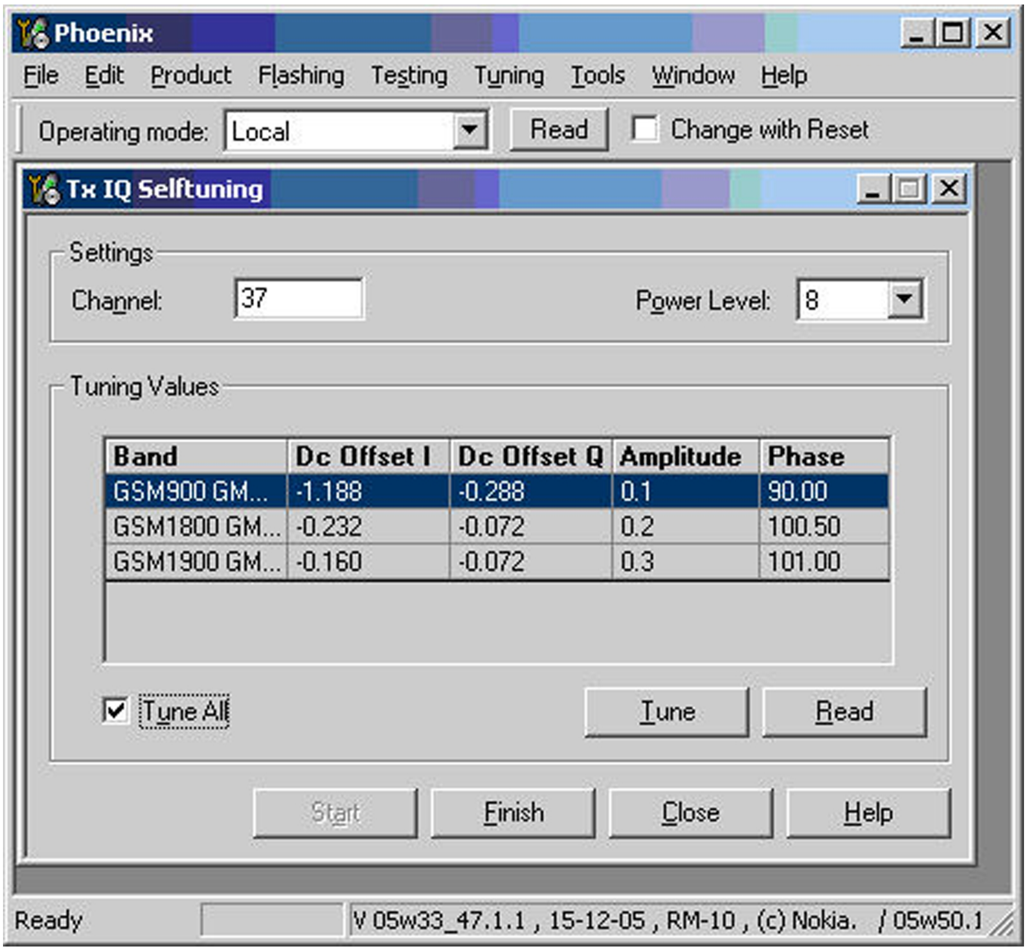
Context

- The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning balances the I and Q branches.
- Tx IQ tuning must be performed on all GSM bands.

Steps

1. Start Phoenix service software.
2. Choose File→Scan Product.
3. From the Operating mode drop-down menu, set mode to Local.
4. Choose Tuning→GSM→Tx IQ selftuning.
5. Click Start.
6. Check **tune all** checkbox and press tune button.

   Wait until the automatic tuning feature has finished. Values are written to the phone memory automatically.


Phoenix
File Edit Product Flashing Testing Tuning Tools Window Help
Read
☐ Change with Reset
Tx IQ Selftuning
Settings
Tuning Values
☑ Tune All
Tune
Read
Start
Finish
Close
Help

Operating mode: Local

Channel: 37

Power Level: 8

Band	Dc Offset I	Dc Offset Q	Amplitude	Phase
GSM900 GM...	-1.188	-0.288	0.1	90.00
GSM1800 GM...	-0.232	-0.072	0.2	100.50
GSM1900 GM...	-0.160	-0.072	0.3	101.00

Ready V 05w33_47.1.1 , 15-12-05 , RM-10 , (c) Nokia. / 05w50.1

Tx power level tuning (GSM)

Context

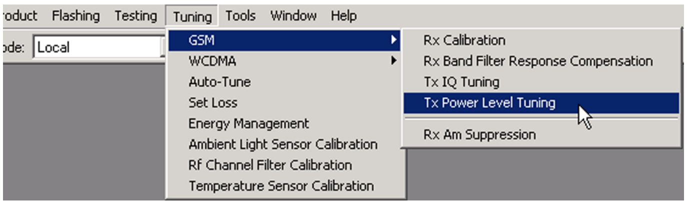
Because of variations at IC process and discrete component values, the actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

For EDGE transmission the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. Start Phoenix service software.
3. From the "Operating mode" dropdown menu, set mode to "Local".
4. From the Tuning menu, choose GSM -> Tx Power Level Tuning.


oduct Flashing Testing Tuning Tools Window Help
ode: Local
GSM
WCDMA
Auto-Tune
Set Loss
Energy Management
Ambient Light Sensor Calibration
RF Channel Filter Calibration
Temperature Sensor Calibration
Rx Calibration
Rx Band Filter Response Compensation
Tx IQ Tuning
Tx Power Level Tuning
Rx Am Suppression

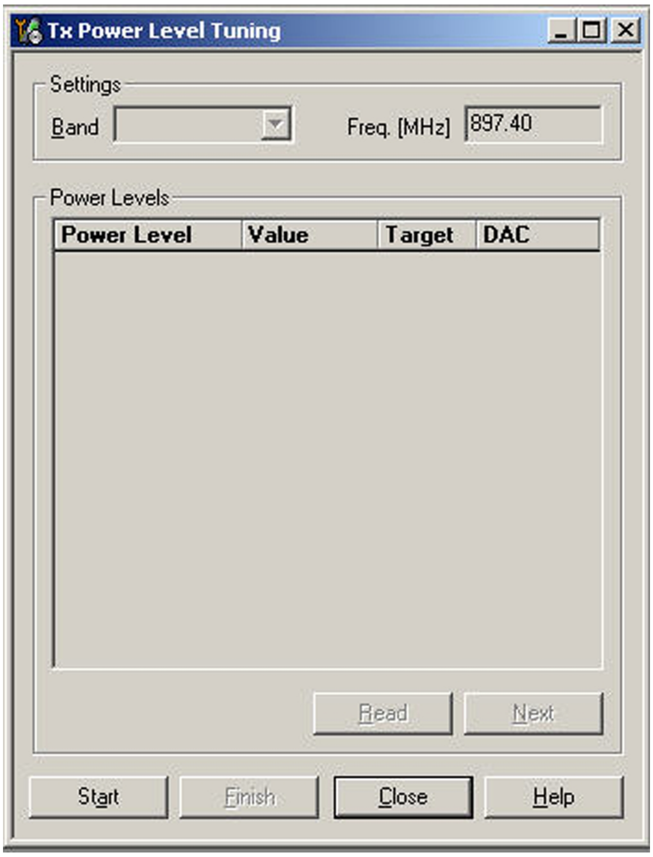
5. Set the spectrum analyzer for power level tuning:

Table 17

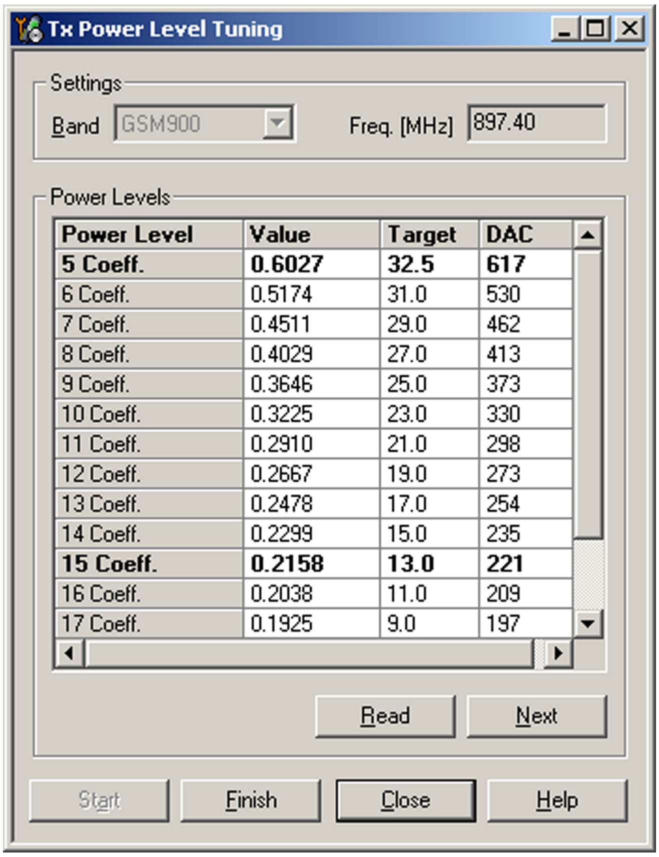
Frequency	Channel frequency (836.6MHz GSM850, 897.4MHz GSM900, 1747.8MHz GSM1800, 1880MHz GSM1900)
Span	200 kHz
Sweep time	3 s
Trigger	Video triggering: Free run
Resolution BW	1 MHz (min. 600 kHz)
Video BW	3 kHz
Reference level offset	Sum cable attenuation with module jig attenuation
Reference level	35 dBm
Detector	Max Peak

A power meter with a peak power detector can be also used. Remember to take the attenuations in the account!

6. Click Start.


Tx Power Level Tuning
Settings
Band
Freq. [MHz]
897.40
Power Levels
Power Level
Value
Target
DAC
Read
Next
Start
Finish
Close
Help

7. Adjust power levels **5**, **15** and **19** to correspond the "Target dBm" column by pressing + or – keys.



Band: GSM900
Freq. [MHz]: 897.40

Power Level	Value	Target	DAC
5 Coeff.	**0.6027**	**32.5**	**617**
6 Coeff.	0.5174	31.0	530
7 Coeff.	0.4511	29.0	462
8 Coeff.	0.4029	27.0	413
9 Coeff.	0.3646	25.0	373
10 Coeff.	0.3225	23.0	330
11 Coeff.	0.2910	21.0	298
12 Coeff.	0.2667	19.0	273
13 Coeff.	0.2478	17.0	254
14 Coeff.	0.2299	15.0	235
15 Coeff.	**0.2158**	**13.0**	**221**
16 Coeff.	0.2038	11.0	209
17 Coeff.	0.1925	9.0	197

Check that the coeffiecient values are within the limits specified in the following table.

	Min	Typ	Max
GSM850/GSM900 EDGE off			
PL5 coefficient	0.45	0.626	0.73
PL15 coefficient		0.234	
PL19 coefficient	0.12	0.195	0.3
GSM850/GSM900 EDGE on			
PL8 coefficient	0.35	0.419	0.6
PL15 coefficient		0.247	
PL19 coefficient	0.12	0.204	0.3
GSM1800 EDGE off			
PL0 coefficient	0.45	0.51	0.7
PL11 coefficient		0.219	
PL15 coefficient	0.12	0.185	0.3
GSM1800 EDGE on			
PL2 coefficient	0.35	0.394	0.6
PL11 coefficient		0.23	

	Min	Typ	Max
PL15 coefficient	0.12	0.194	0.3
GSM1900 EDGE off			
PL0 coefficient	0.45	0.482	0.7
PL11 coefficient		0.218	
PL15 coefficient	0.12	0.184	0.3
GSM1900 EDGE on			
PL2 coefficient	0.35	0.377	0.6
PL11 coefficient		0.23	
PL15 coefficient	0.12	0.193	0.3

8. If the values are within the limits, If the values are within the limits, proceed to EDGE tuning by clicking **Next**.
9. Change video averaging to 50 in EDGE tuning if possible (remember to use spectrum analyzer's PEAK detector; some spectrum analyzer cannot use averaging when using PEAK detector).
10. Tune EDGE power levels to the corresponding target power levels.

    Only power levels **8**, **15** and **19** are tuned in GSM900 and **2**, **10** and **15** in GSM1800/1900.
11. Proceed to the next band by pressing **Next**.
12. When the tuning is completed, close the Tx Power Level Tuning window.

WCDMA receiver tunings

RX calibration (WCDMA)

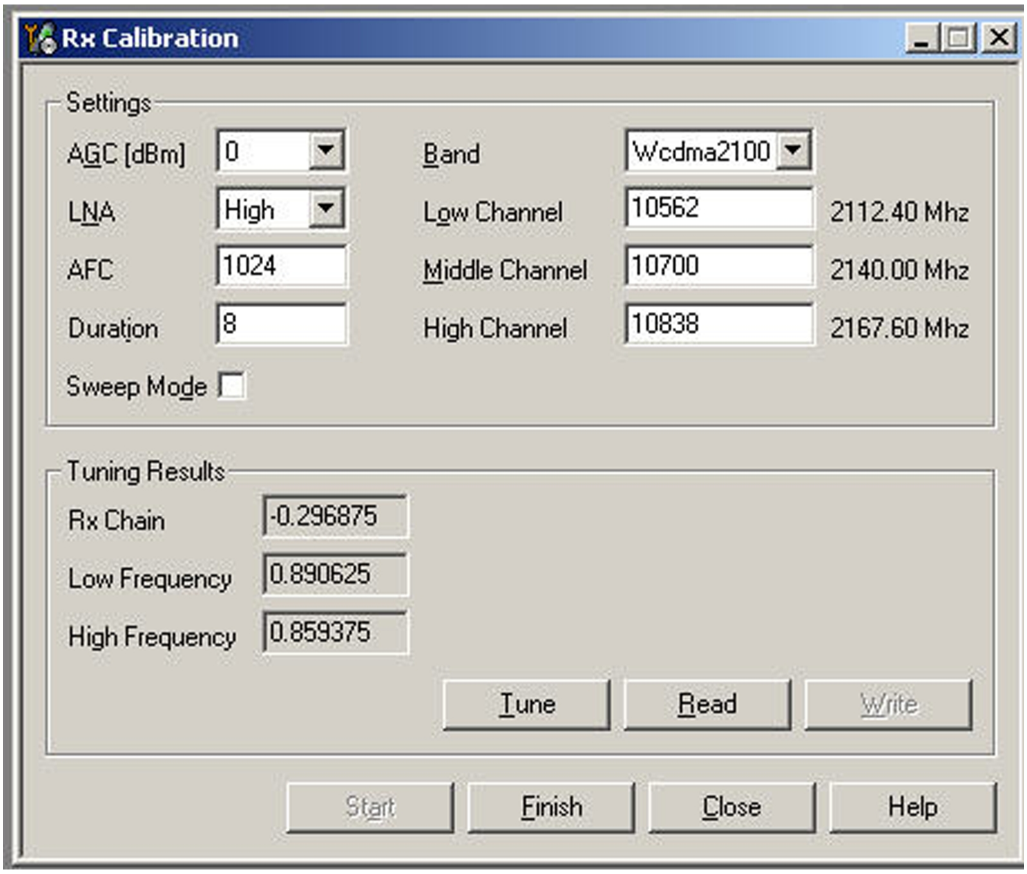
Context

RX calibration tuning is used to find out the real gain values of the WCDMA Rx AGC system and converters.

Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. From the **Operating mode** drop-down menu, set mode to **Local**.
3. Choose **Tuning→WCDMA→RX Calibration** .

4. Click **Start** and **Tune**.



Rx Calibration

Settings

AGC [dBm]: 0

LNA: High

AFC: 1024

Duration: 8

Sweep Mode ☐

Band: Wcdma2100

Low Channel: 10562 2112.40 Mhz

Middle Channel: 10700 2140.00 Mhz

High Channel: 10838 2167.60 Mhz

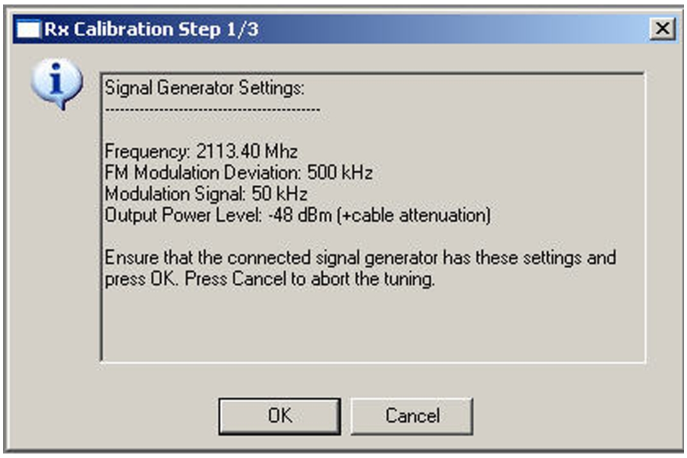
Tuning Results

Rx Chain: -0.296875

Low Frequency: 0.890625

High Frequency: 0.859375

5. Setup the signal generator to correspond the values in the *RX Calibration* pop-up window and click **OK**. RX Calibration includes 3 steps calibration with 3 frequencies. Click “OK” after each step.

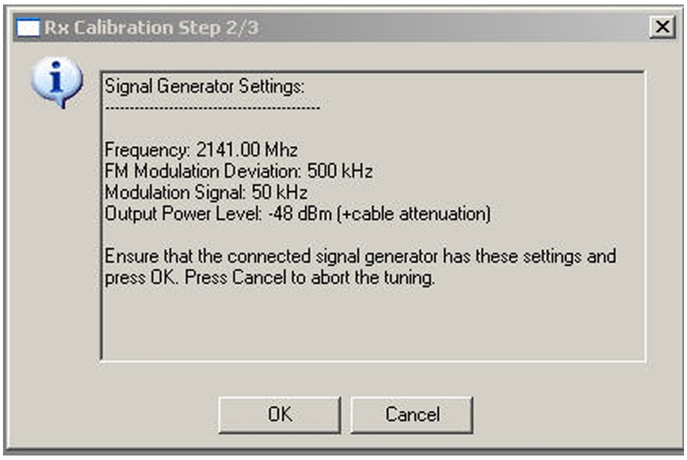


Rx Calibration Step 1/3

Signal Generator Settings:

Frequency: 2113.40 Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)

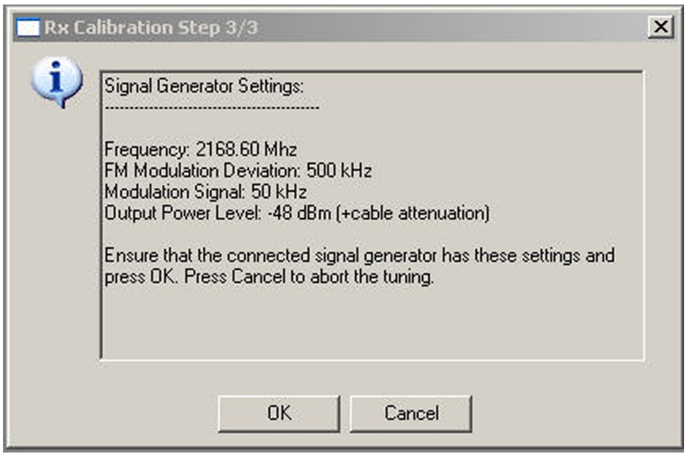
Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.



Signal Generator Settings:

Frequency: 2141.00 Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)

Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.



Signal Generator Settings:

Frequency: 2168.60 Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)

Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.

6. Check that the *Rx chain* value in *Tuning Results* is within the limits presented in the following table.

	Min	Typ	Max	Unit
RX chain	-6	-2... 2	6	dB
Low freq	-3	-1... 2	3	
High freq	-3	-1... 2	3	

i If the RX calibration values are within the limits, click **Write** and **Finish** to save the results to the phone.

7. To close the *Rx AGC Alignment* window, click **Close**.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

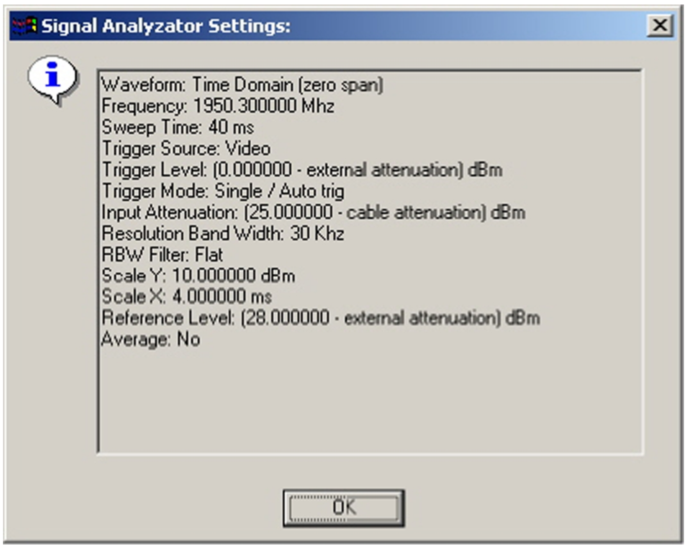
Tx AGC & power detector tuning has two purposes:

- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

Steps

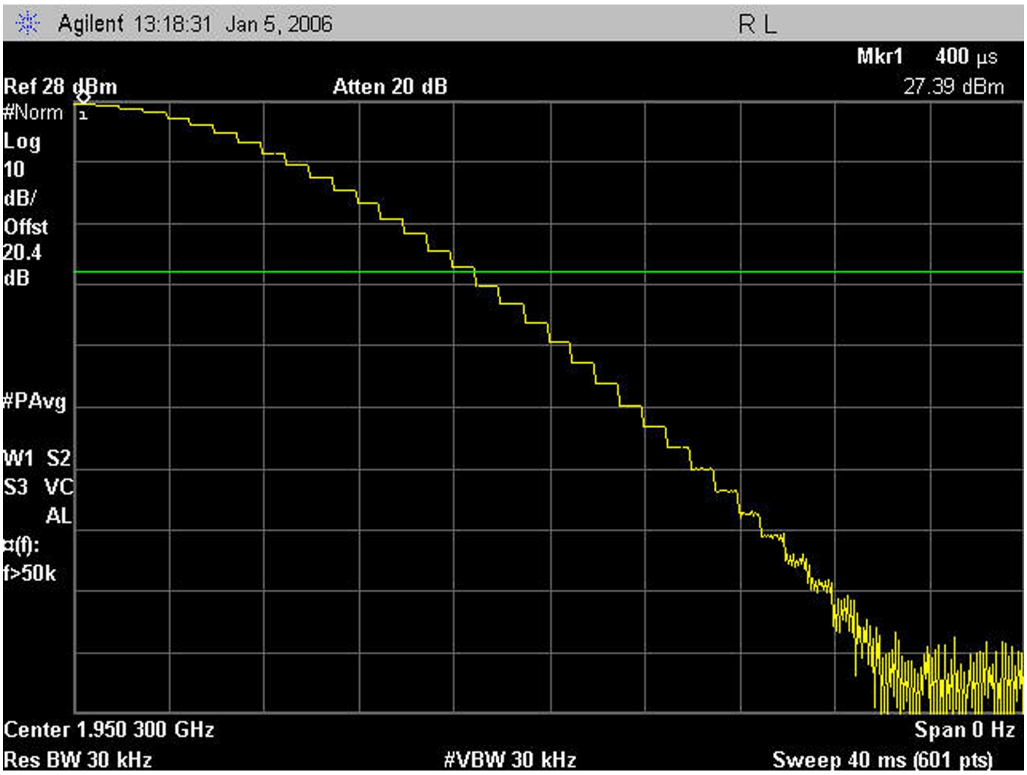
1. From the **Operating mode** drop-down menu, set mode to **Local**.

2. Choose **Tuning→WCDMA→TX AGC And Power Detector Tuning.**
3. Click **Start**.
4. In the *Wide Range* pane, click **Tune** (the leftmost **Tune** button).
5. Set up the spectrum analyzer in the following way:

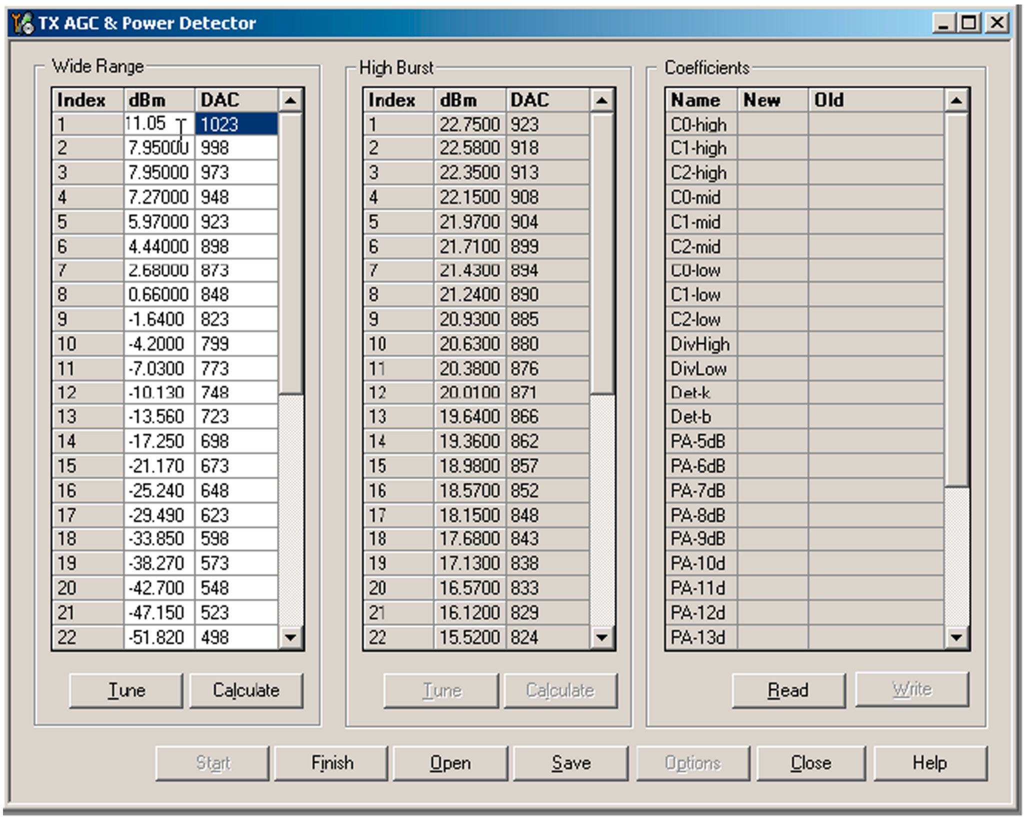

Signal Analyzator Settings:
OK

Waveform: Time Domain (zero span)
Frequency: 1950.300000 Mhz
Sweep Time: 40 ms
Trigger Source: Video
Trigger Level: (0.000000 - external attenuation) dBm
Trigger Mode: Single / Auto trig
Input Attenuation: (25.000000 - cable attenuation) dBm
Resolution Band Width: 30 Khz
RBW Filter: Flat
Scale Y: 10.000000 dBm
Scale X: 4.000000 ms
Reference Level: (28.000000 - external attenuation) dBm
Average: No

6. After setting the spectrum analyzer, click **OK**.
7. Measure the power levels with a marker and fill them to the table starting from the highest one. The lowest power level filled to the table should be at least <-50 dBm. Measured power levels must be monotonously decreasing.


Agilent 13:18:31 Jan 5, 2006
R L
Mkr1 400 µs
27.39 dBm
Ref 28 dBm
Atten 20 dB
#Norm
Log
10
dB/
Offst
20.4
dB
#PAvg
W1 S2
S3 VC
AL
¤(f):
f>50k
Center 1.950 300 GHz
Span 0 Hz
Res BW 30 kHz
#VBW 30 kHz
Sweep 40 ms (601 pts)

8. Fill in the power level values (in dBm) to the *Wide Range* table.


TX AGC & Power Detector
Wide Range
High Burst
Coefficients
Tune
Calculate
Tune
Calculate
Read
Write
Start
Finish
Open
Save
Options
Close
Help

Wide Range

Index	dBm	DAC
1	11.05	1023
2	7.95000	998
3	7.95000	973
4	7.27000	948
5	5.97000	923
6	4.44000	898
7	2.68000	873
8	0.66000	848
9	-1.6400	823
10	-4.2000	799
11	-7.0300	773
12	-10.130	748
13	-13.560	723
14	-17.250	698
15	-21.170	673
16	-25.240	648
17	-29.490	623
18	-33.850	598
19	-38.270	573
20	-42.700	548
21	-47.150	523
22	-51.820	498

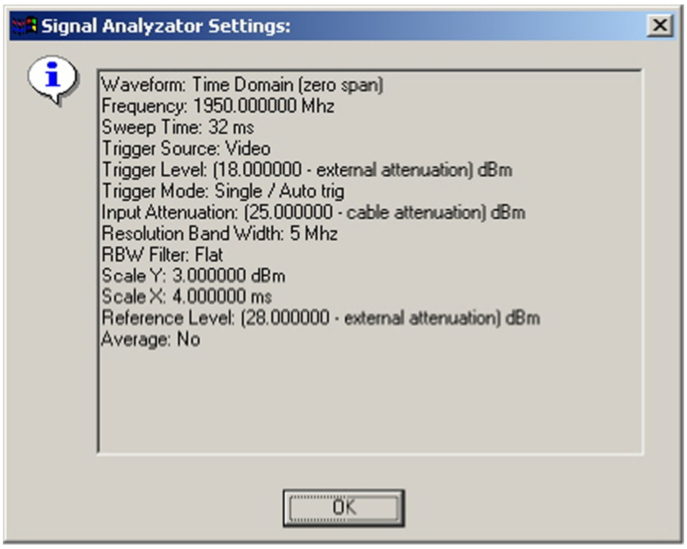
High Burst

Index	dBm	DAC
1	22.7500	923
2	22.5800	918
3	22.3500	913
4	22.1500	908
5	21.9700	904
6	21.7100	899
7	21.4300	894
8	21.2400	890
9	20.9300	885
10	20.6300	880
11	20.3800	876
12	20.0100	871
13	19.6400	866
14	19.3600	862
15	18.9800	857
16	18.5700	852
17	18.1500	848
18	17.6800	843
19	17.1300	838
20	16.5700	833
21	16.1200	829
22	15.5200	824

Coefficients

Name	New	Old
C0-high		
C1-high		
C2-high		
C0-mid		
C1-mid		
C2-mid		
C0-low		
C1-low		
C2-low		
DivHigh		
DivLow		
Det-k		
Det-b		
PA-5dB		
PA-6dB		
PA-7dB		
PA-8dB		
PA-9dB		
PA-10d		
PA-11d		
PA-12d		
PA-13d		

9. In the *Wide Range* pane, click **Calculate**.
10. In the *High Power Burst* pane, click **Tune**.
11. Adjust the spectrum analyzer according to the following settings (in addition depending on spectrum analyzer use 30 kHz video bandwidth):


Signal Analyzator Settings:
OK

Waveform: Time Domain (zero span)
Frequency: 1950.000000 Mhz
Sweep Time: 32 ms
Trigger Source: Video
Trigger Level: (18.000000 - external attenuation) dBm
Trigger Mode: Single / Auto trig
Input Attenuation: (25.000000 - cable attenuation) dBm
Resolution Band Width: 5 Mhz
RBW Filter: Flat
Scale Y: 3.000000 dBm
Scale X: 4.000000 ms
Reference Level: (28.000000 - external attenuation) dBm
Average: No

12. Measure the power levels with a marker and fill them to the table starting from the highest one. Measured power levels must be monotonously decreasing.

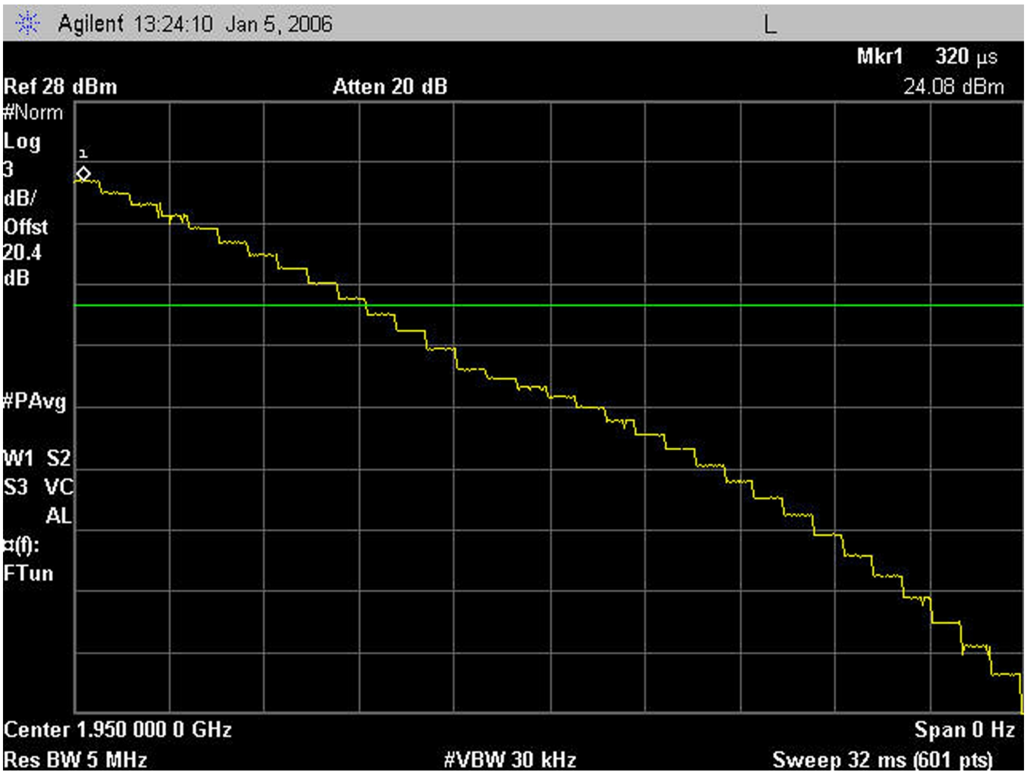

Agilent 13:24:10 Jan 5, 2006
L
Mkr1 320 µs
Ref 28 dBm
Atten 20 dB
24.08 dBm
#Norm
Log
3
dB/
Offst
20.4
dB
1
#PAvg
W1 S2
S3 VC
AL
¤(f):
FTun
Center 1.950 000 0 GHz
Span 0 Hz
Res BW 5 MHz
#VBW 30 kHz
Sweep 32 ms (601 pts)

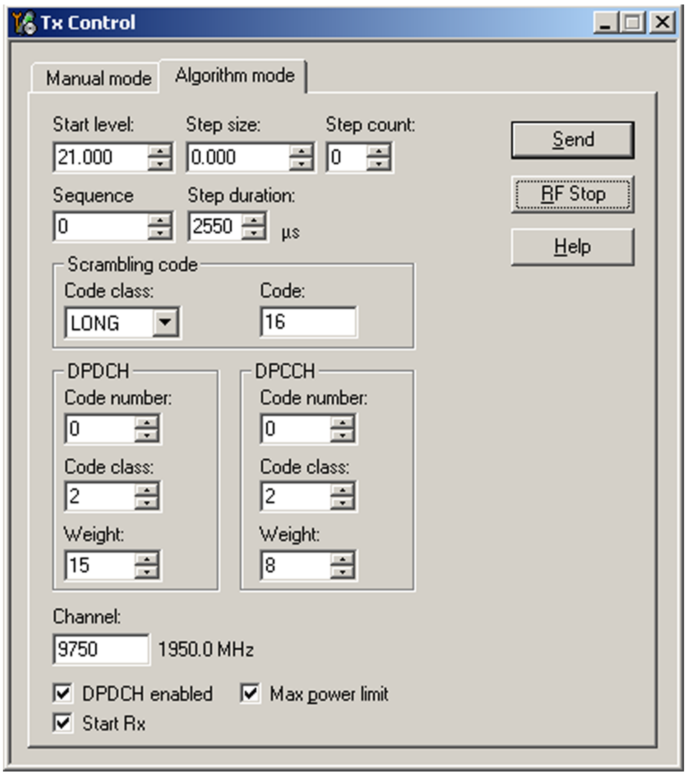
Figure 47 High burst measurement

13. In the *High Burst* pane, click **Calculate**.
14. Check that the calculated values are within the limits specified in the following table:

	Min	Max
C0-high	-0.5	5
C1-high	-50	50
C2-high	400	900
C0-mid	-0.7	0.7
C1-mid	0	50
C2-mid	400	900
C0-low	-4	4
C1-low	-400	440
C2-low	-10000	15000
Det-k	100	220
Det-b	0	150

15. To save the coefficients to the phone, click **Write**.
16. To close the *Tx AGC & Power Detector* window, click **Close**.
17. Choose **Testing→WCDMA→ Tx Control.**

18. Select the *Algorithm* mode tab.



Start level: 21.000
Step size: 0.000
Step count: 0
Sequence: 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code number: 0
Code class: 2
Weight: 15

DPCCH
Code number: 0
Code class: 2
Weight: 8

Channel: 9750 1950.0 MHz

☑ DPDCH enabled ☑ Max power limit
☑ Start Rx

19. Write the target power level 28 dBm to the *Start level* box and check the **Max power limit** check box (detector calibration check). Write "1" to *Sequence* box.
20. Setup the spectrum analyzer with the following settings:

Table 18

Center frequency	1950.0 MHz
Span	0 Hz
Reference level offset	Cable attenuations + adapter attenuation
Reference level	28 dBm or -20 dBm depending on the level measured
Input attenuation	Automatic
Resolution bandwidth	5 MHz
Video bandwidth	5 MHz (depending on spectrum analyzer use 30 kHz VBW)
Sweep time	5 ms
Detector	RMS detector
Average	No
Trigger level	Video 0 dBm or -45 dBm

21. Measure the WCDMA output power. It should be around 23.5 dBm.
22. Click **RF Stop** and uncheck the **Max power limit** check box.

23. Repeat steps **19** to **23** for levels +19, +7, 0, -20 and –40 dBm.

    The measured output power may not differ more than +-2 dB from the requested value at level +19 dBm and no more than +-4 dB on lower levels.

    Remember to stop the RF before sending new data.

Tx band response calibration (WCDMA)

Context

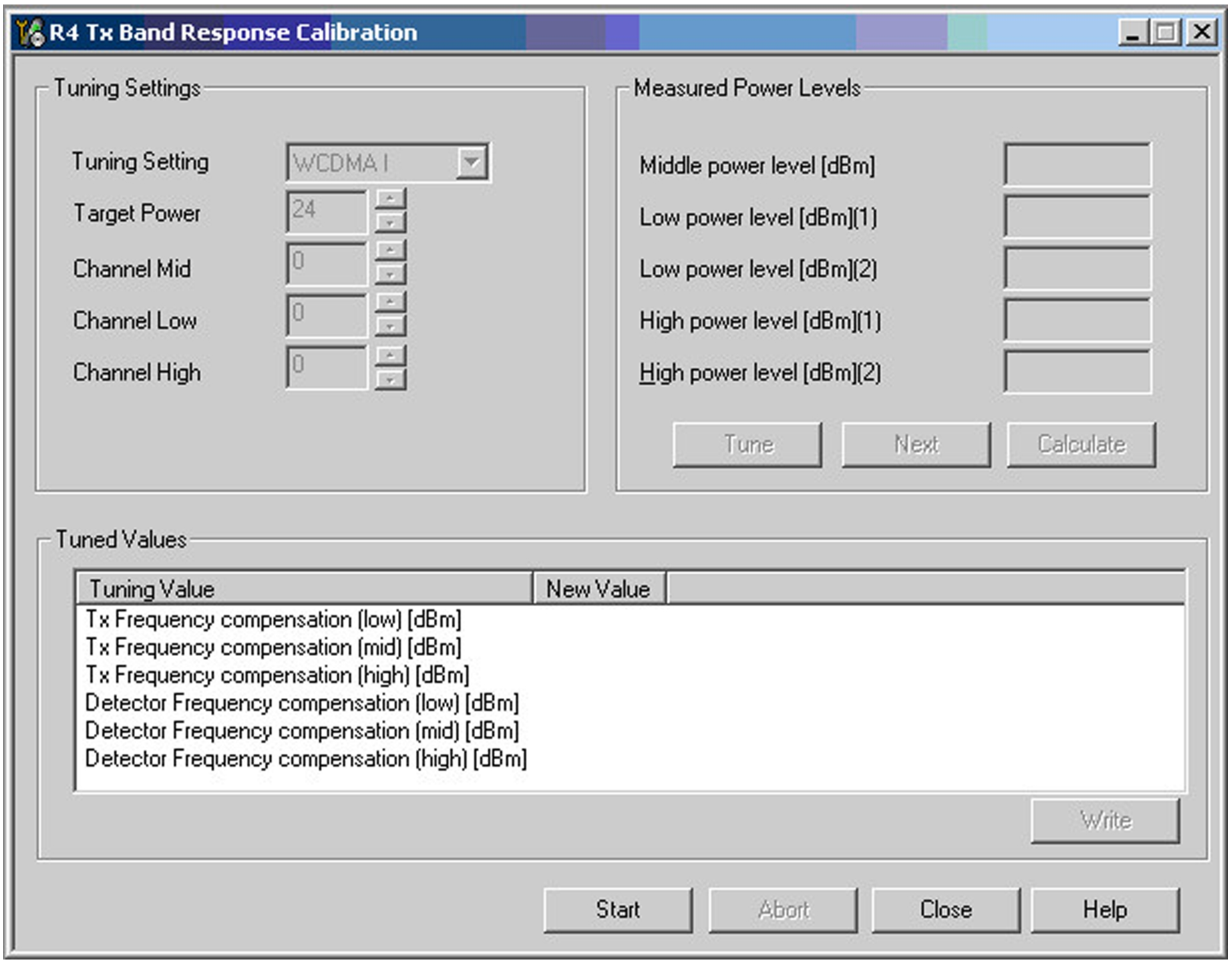
The purpose of this tuning operation is to calibrate the WCDMA Tx performance. It defines the power detector and Tx frequency compensation values. However, before starting this tuning procedure, it is necessary to carry out Tx AGC & Power Detector Calibration tuning. This is because its results will be needed for this tuning operation.

- In the *Tuning Settings* pane, it is possible to select WCDMA band (WCDMA I).
- **Target power** shows the power level used for calibrating tx frequency in this tuning procedure.
- In *Measured Power Levels* pane, you can insert the dBm values read from the power meter.
- In *Tuned Values* pane, the values that are stored in the permanent memory (PM) of the terminal in Current columns are shown.
- New values are added to *New* column when the **Calculate** button is clicked.
- **Abort** button aborts the tuning operation without saving the tuned values.
- **Read** button reads the tuned values in the PM of the terminal, and displays them in the *Tuned Values* pane in in the *Current* column.

Steps

1. Start *Phoenix* service software.
2. Choose **File→Scan Product** .
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→WCDMA→Tx Band Response Calibration** .

5. Click **Start**.



Tuning Setting: WCDMA I
Target Power: 24
Channel Mid: 0
Channel Low: 0
Channel High: 0

Middle power level [dBm]
Low power level [dBm](1)
Low power level [dBm](2)
High power level [dBm](1)
High power level [dBm](2)

Tuning Value	New Value
Tx Frequency compensation (low) [dBm]	
Tx Frequency compensation (mid) [dBm]	
Tx Frequency compensation (high) [dBm]	
Detector Frequency compensation (low) [dBm]	
Detector Frequency compensation (mid) [dBm]	
Detector Frequency compensation (high) [dBm]	

The current values are shown in the *Tuned Values* pane.

6. Click **Tune**.
7. Connect the spectrum analyzer to the terminal, and set it to **Channel Mid** frequency. Use spectrum analyzer's RMS detector and depending on spectrum analyzer use 30 kHz video bandwidth.
8. Read the values from the power meter and enter them to **Middle power level** fields in the **Measured Power Levels** pane.
9. Click **Next**.
10. Switch the power meter to **Channel Low** frequency.
11. Read the values from the power meter, and enter them to **Low power level** fields.
12. Switch the power meter to **Channel High** frequency.
13. Read the values from the power meter, and enter them to **High power level** fields.
14. Click **Next**.
15. Click **Calculate**.

    The tuned values are shown in the *Tuned Values* pane in the *New* column.
16. Check that the tuned values are within the limits presented in the following table. If they are OK, click **Yes**.

	Min	Max
Tx Freq Comp (the first and last value)	-4	+4

17. To save the tuned values to the terminal, click **Write**.
18. Close the *Tx Band Response Calibration* window.

Tx LO leakage (WCDMA)

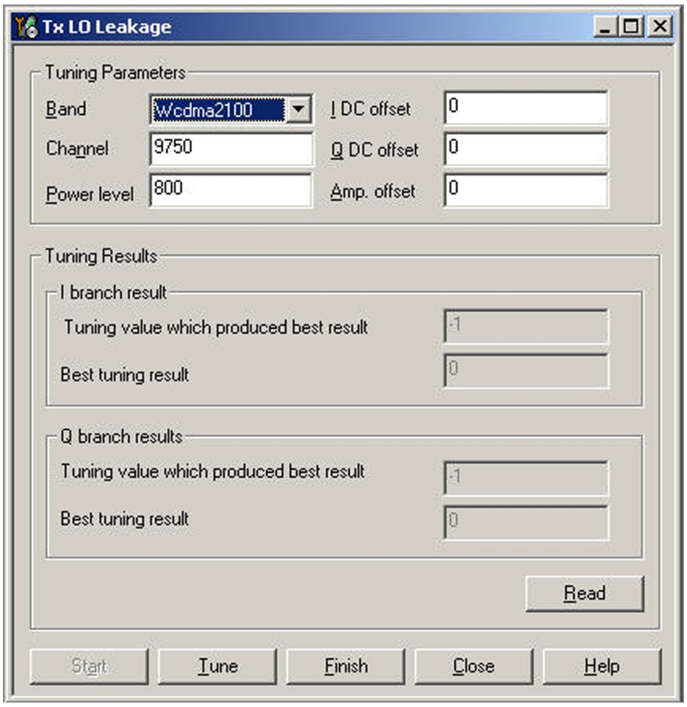
Context

The purpose of Tx LO leakage tuning is to minimize the carrier leakage of the IQ-modulator which is caused by the DC offset voltages in the Tx IQ-signal lines and in the actual IQ modulator.

The tuning improves WCDMA Tx AGC dynamics at low power levels. A self-calibration routine selects the best combination for internal control words in order to produce minimum LO leakage.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning**→**WCDMA**→ **Tx LO Leakage** .
3. Click **Tune**.



Band: Wcdma2100
Channel: 9750
Power level: 800
I DC offset: 0
Q DC offset: 0
Amp. offset: 0

I branch result
Tuning value which produced best result: -1
Best tuning result: 0

Q branch results
Tuning value which produced best result: -1
Best tuning result: 0

4. Click **Finish** and then **Close**.

WLAN troubleshooting

Introduction to WLAN troubleshooting

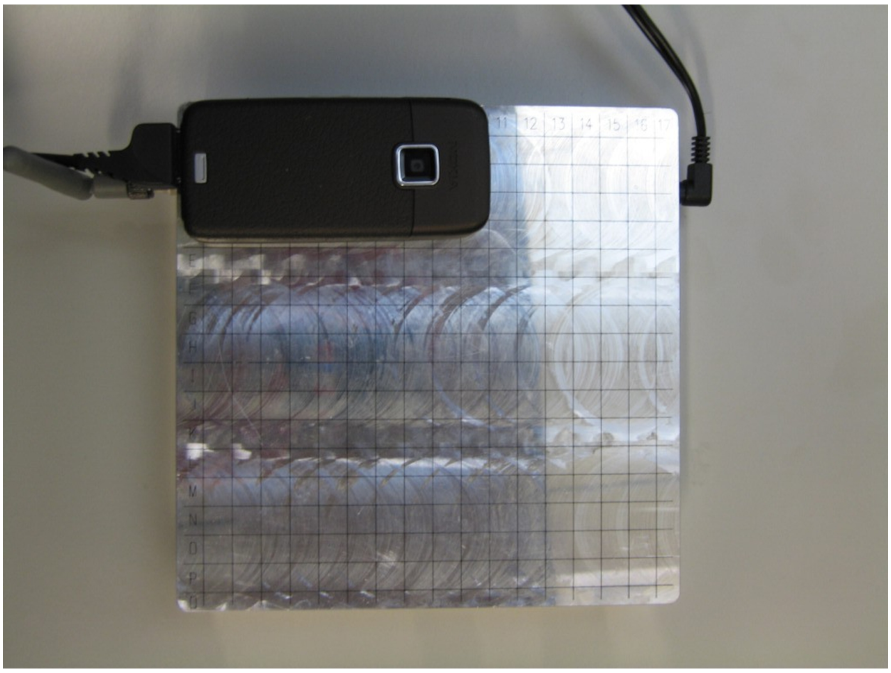
The main problem that can occur is malfunction in WLAN or WLAN ASICs or WLAN SMD components. Such problems are unpredictable and may have many causes, either HW or SW related.

> **Note:** While WLAN power tuning is not possible without power meter especially capable for measuring WLAN wideband power, WLAN ICs (WLAN IC and BTH/WLAN front-end module) shall not be changed.

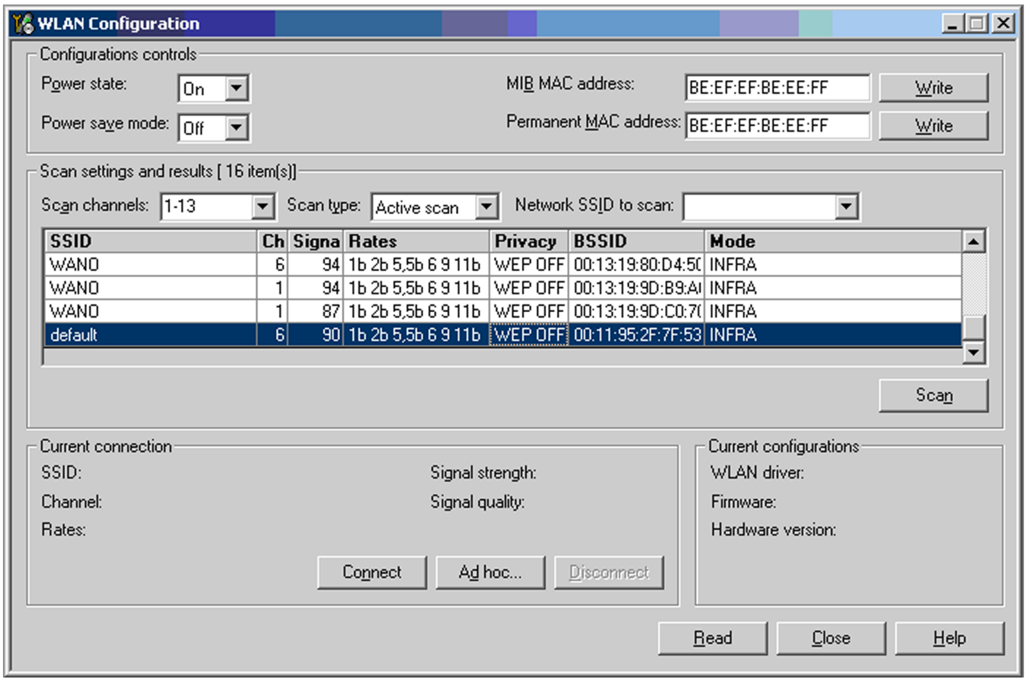
WLAN functionality test using SB-7 and Phoenix

Steps

1. Place the phone on the SB-7 WLAN test box, see figure below.



2. Start *Phoenix* service software and turn the phone to the local mode.
3. 3. From the **Testing** menu, choose **WLAN Configuration**, the following window should come up:



WLAN Configuration

Configurations controls

Power state: On

Power save mode: Off

MIB MAC address: BE:EF:EF:BE:EE:FF

Permanent MAC address: BE:EF:EF:BE:EE:FF

Scan settings and results [16 item(s)]

Scan channels: 1-13

Scan type: Active scan

Network SSID to scan:

SSID	Ch	Signa	Rates	Privacy	BSSID	Mode
WANO	6	94	1b 2b 5,5b 6 9 11b	WEP OFF	00:13:19:80:D4:5	INFRA
WANO	1	94	1b 2b 5,5b 6 9 11b	WEP OFF	00:13:19:9D:B9:A	INFRA
WANO	1	87	1b 2b 5,5b 6 9 11b	WEP OFF	00:13:19:9D:C0:7	INFRA
default	6	90	1b 2b 5,5b 6 9 11b	WEP OFF	00:11:95:2F:7F:53	INFRA

Current connection

SSID:

Channel:

Rates:

Signal strength:

Signal quality:

Current configurations

WLAN driver:

Firmware:

Hardware version:

4. Turn the **Power state: On** and press **Scan**.
5. After few seconds, list of found WLAN networks should be updated. If WLAN is working, and at least a station with SSID name **default**, should be found.

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8 — Camera Module Troubleshooting

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Introduction to camera module troubleshooting

Background, tools and terminology

Faults or complaints in camera operation can be roughly categorised into three subgroups:

1. Camera is not functional at all; no image can be taken.
2. Images can be taken but there is nothing recognizable in them.
3. Images can be taken and they are recognizable but for some reason the quality of images is seriously degraded.

Image quality is very hard to measure quantitatively, and even comparative measurements are difficult (comparing two images) to do, if the difference is small. Especially if the user is not satisfied with his/her device's image quality, and tells, for example, that the images are not sharp, it is fairly difficult to accurately test the device and get an exact figure which would tell whether the device is functioning properly.

Often subjective evaluation has to be used for finding out if a certain property of the camera is acceptable or not. Some training or experience of a correctly operating reference device may be needed in order to detect what actually is wrong.

It is easy for the user to take bad images in bad conditions. Therefore the camera operation has to be checked always in constant conditions (lighting, temperature) or by using a second, known-to-be good device as reference.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems may be expected to appear:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Terms

Dynamic range	Camera's ability to capture details in dark and bright areas of the scene simultaneously.
Exposure time	Camera modules use silicon sensor to collect light and for forming an image. The imaging process roughly corresponds to traditional film photography, in which exposure time means the time during which the film is exposed to light coming through optics. Increasing the time will allow for more light hitting the film and thus results in brighter image. The operation principle is exactly the same with silicon sensor, but the shutter functionality is handled electronically i.e. there is no mechanical moving parts like in film cameras.
Flicker	Phenomenon, which is caused by pulsating in scene lighting, typically appearing as wide horizontal stripes in an image.
Noise	Variation of response between pixels with same level of input illumination.
Resolution	Usually the amount of pixels in the camera sensor; for example, this product has a 1600 x 1200 pixel sensor resolution. In some occasions the term resolution is used for describing the sharpness of the images.

Sensitivity	Camera module's sensitivity to light. In equivalent illumination conditions, a less sensitive camera needs a longer exposure time to gather enough light in forming a good image. Analogous to ISO speed in photographic film.
Sharpness	Good quality images are 'sharp' or 'crisp', meaning that image details are well visible in the picture. However, certain issues, such as non-idealities in optics, cause image blurring, making objects in picture to appear 'soft'. Each camera type typically has its own level of performance.

The effect of image taking conditions on image quality

There are some factors, which may cause poor image quality, if not taken into account by the end user when shooting images, and thus may result in complaints. The items listed are normal to camera operation and are not a reason for changing the camera module.

Distance to target

The lens in the module is specified to operate satisfactorily from 40 cm to infinite distance of scene objects. In practice, the operation is such that close objects may be noticed to get more blurred when distance to them is shorter than 40 cm. The lack of sharpness is first visible in full resolution (1280 x 1024) images. If observing just the viewfinder, even very close objects may seem to appear sharp. This is normal; do not change the camera module.

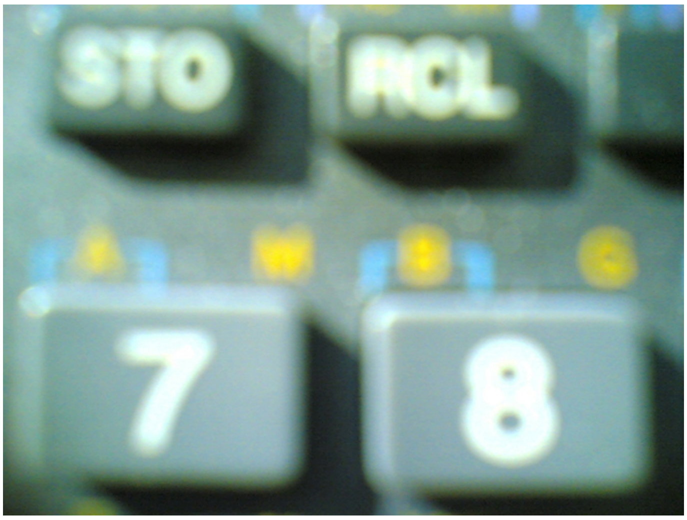


Figure 48 Blurred image. Target too close.

The amount of light available

In dim conditions camera runs out of sensitivity. The exposure time is long (especially in the night mode) and the risk of getting shaken (= blurred) images increases. In addition, image noise level grows. The maximum exposure time in the night mode is ¼ seconds. Therefore, images need to be taken with extreme care and by supporting the phone when the amount of light reflected from the target is low. Because of the longer exposure time and larger gain value, noise level increases in low light conditions. Sometimes blurring may even occur in daytime, if the image is taken very carelessly. See the figure below for an example. This is normal; do not change the camera module.

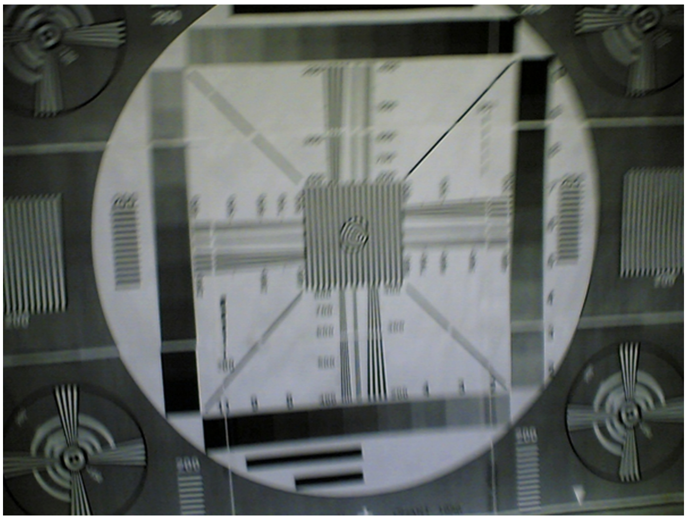


Figure 49 Blurring caused by shaking hands

Movement in bright light

If an image is taken of moving objects or if the device is used in a moving vehicle, object 'skewing' or 'tilting' may occur. This phenomenon is fundamental to most CMOS camera types, and usually cannot be avoided. The movement of camera or object sometimes cause blurring indoors or in dim lighting conditions because of long exposure time. This is normal; do not change the camera module.

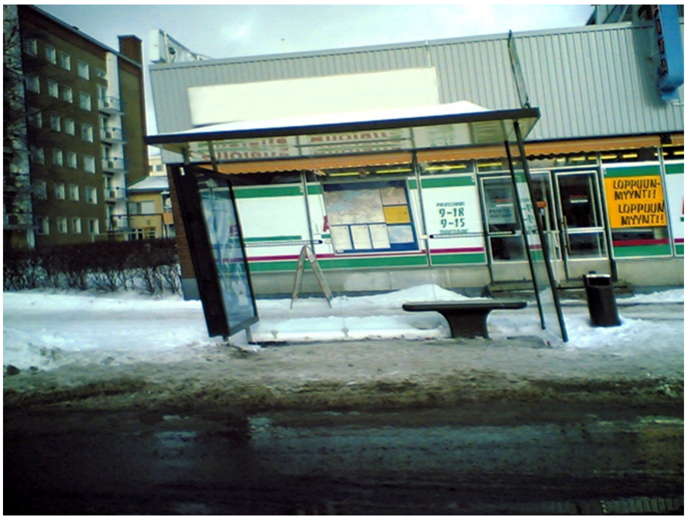


Figure 50 Near objects get skewed when taking images from a moving vehicle

Temperature

High temperatures inside the mobile phone cause more noise to appear in images. For example, in +70 degrees (Celsius), the noise level may be very high, and it further grows if the conditions are dim. If the phone processor has been heavily loaded for a long time before taking an image, the phone might have considerably higher temperature inside than in the surrounding environment. This is also normal to camera operation; do not change the camera module.

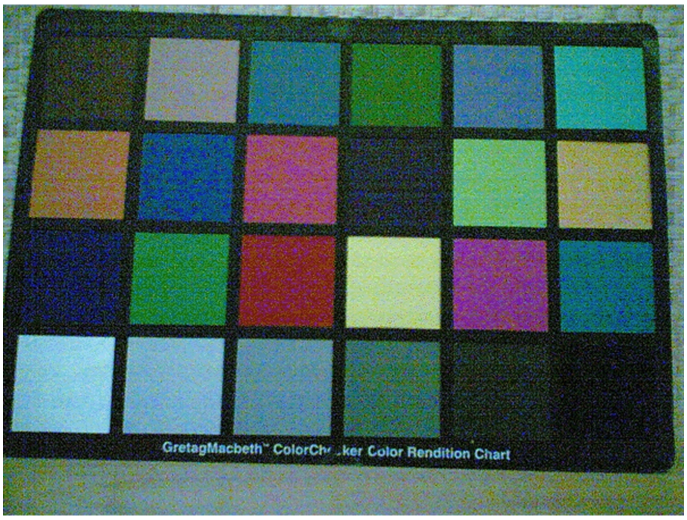


Figure 51 Noisy image taken in +70 degrees Celsius

Phone display

If the display contrast is set too dark, the image quality degrades: the images may be very dark depending on the setting. If the display contrast is set too bright, image contrast appears bad and "faint". This problem is solved by setting the display contrast correctly. This is normal behaviour; do not change the camera module.

Basic rules of photography (especially shooting against light)

Because of dynamic range limitations, taking images against bright light might cause either saturated image or the actual target appear too dark. In practice, this means that when taking an image indoors and having, for example, a window behind the object, the result is usually poor. This is normal behaviour; do not change the camera module.

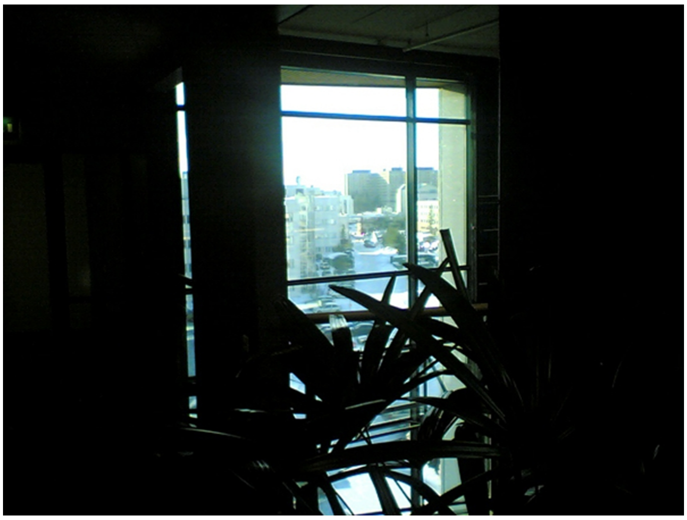


Figure 52 Image taken against light

Flicker

In some occasions a bright fluorescent light may cause flicker in the viewfinder and captured image. This phenomenon may also be a result, if images are taken indoors under the mismatch of 50/60 Hz electricity network frequency. The electricity frequency used is automatically detected by the camera module. In some very few countries, both 50 and 60 Hz networks are present and thus probability for the phenomenon increases. Flickering occurs also under high artificial illumination level. This is normal behaviour; do not change the camera module.

Figure 53 Flicker in an image; object illuminated by strong fluorescent light

Bright light outside of image view

Especially the sun can cause clearly visible lens glare phenomenon and poor contrast in images. This happens because of undesired reflections inside the camera optics. Generally this kind of reflections are common in all optical systems. This is normal behaviour; do not change the camera module.

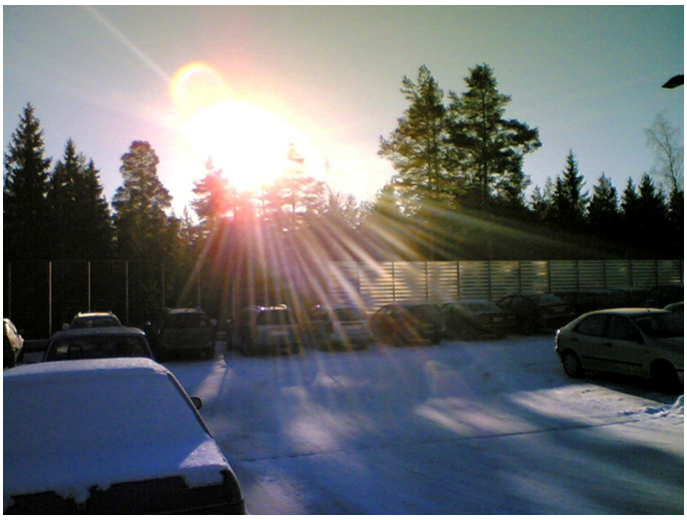


Figure 54 A lens reflection effect caused by sunshine

Examples of good quality images

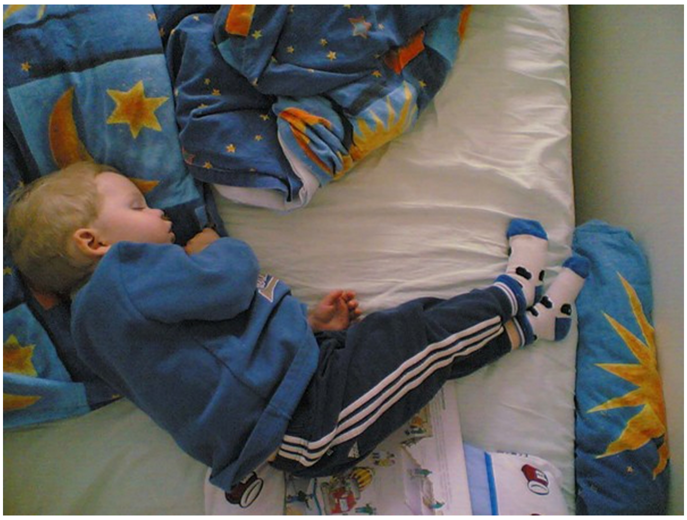


Figure 55 Good image taken indoors

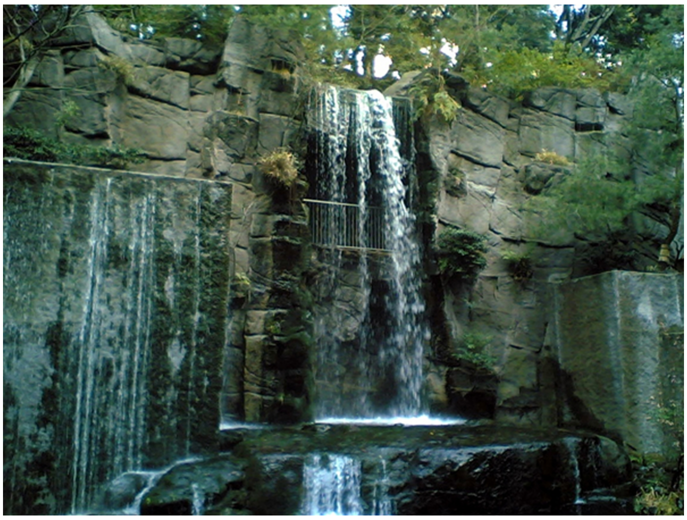


Figure 56 Good image taken outdoors

■ Camera construction

This section describes the mechanical construction of the camera module for getting a better understanding of the actual mechanical structure of the module.

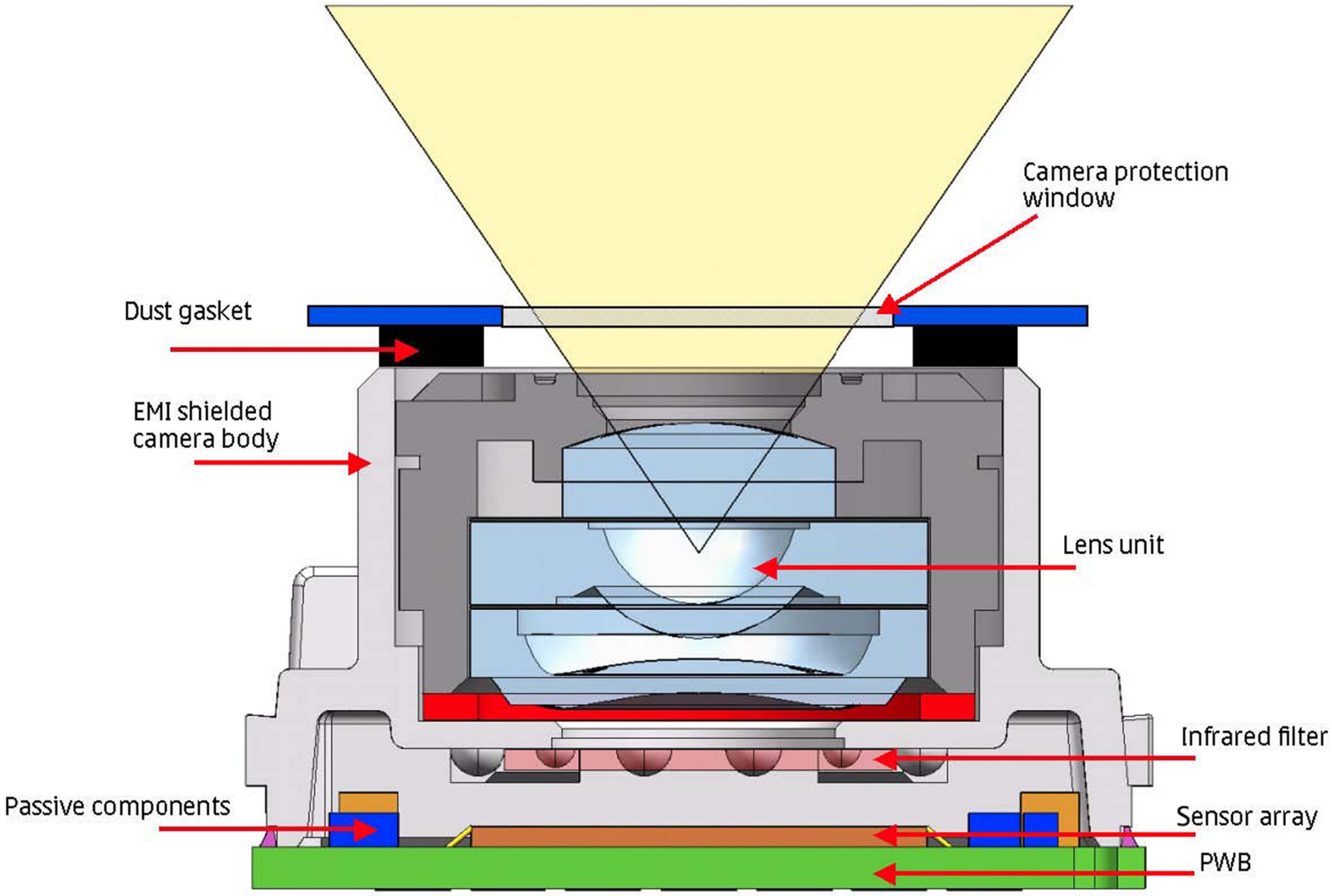

Camera protection window
Dust gasket
EMI shielded camera body
Lens unit
Infrared filter
Passive components
Sensor array
PWB

Figure 57 Camera module cross section and assembly principle

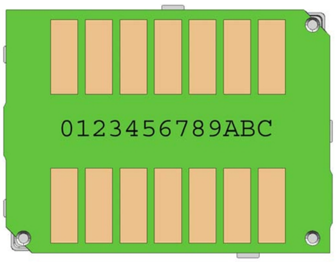

0123456789ABC

Figure 58 Camera module bottom view including serial numbering

The camera module as a component is not a repairable part, meaning that the components inside the module may not be changed. Cleaning dust from the front face is allowed only. Use clean compressed air.

The camera module uses socket type connecting. For versioning, laser marked serial numbering is used on the PWB.

The main parts of the module are:

- Lens unit including lens aperture.
- Infrared filter; used to prevent infrared light from contaminating the image colors. The IR filter is glued to the EMI shielded camera body.
- Camera body; made of conductive metallized plastic and attached to the PWB with glue.
- Sensor array including DSP functions is glued and wire-bonded to the PWB.
- PWB, FR-4 type
- Socket type connection

- Laser-marked serial numbering on PWB (for versioning)
- Passive components
- Camera protection window; part of the phone cover mechanics
- Dust gasket between the lens unit and camera protection window

Image quality analysis

Testing for dust in camera module

Symptoms and diagnosis

For detecting dust problems, take an image of a uniform white surface and analyse it in full resolution. A good quality PC CRT monitor is preferred for analysis (avoid using LCD). Search carefully because finding these defects is not always easy. Figure "Effects of dust on optical path" is an example of an image having easily detectable dust problems.

When taking a white image, use uniformly lightened white paper or white wall. Another option is to use uniform light but in this case make sure that the camera image is not flickering when taking the test image. In case flickering occurs, try to reduce the illumination level. Use JPEG image format for analysing, and set the image quality parameter to ‘High Quality’.

Black spots in an image are caused by dirt particles trapped inside the optical system. Clearly visible and sharp edged black dots in an image are typically dust particles on the image sensor. These spots are searched for in the manufacturing phase, but it is possible that the camera body cavity contains a particle, which may move onto the image sensor active surface, for example, when the phone is dropped. Therefore it is also possible that the problem will disappear before the phone is brought to service. The camera should be replaced if the problem is present when the service technician analyses the phone.

If dust particles are lying on the infrared filter surface on either side, they are hard to locate because they are out of focus, and appear in the image as large, grayish and fading-edge 'blobs'. Sometimes they are invisible to the eye, and the user probably does not notice them at all. However, it is possible that a larger particle disturbs the user, causing need for service.

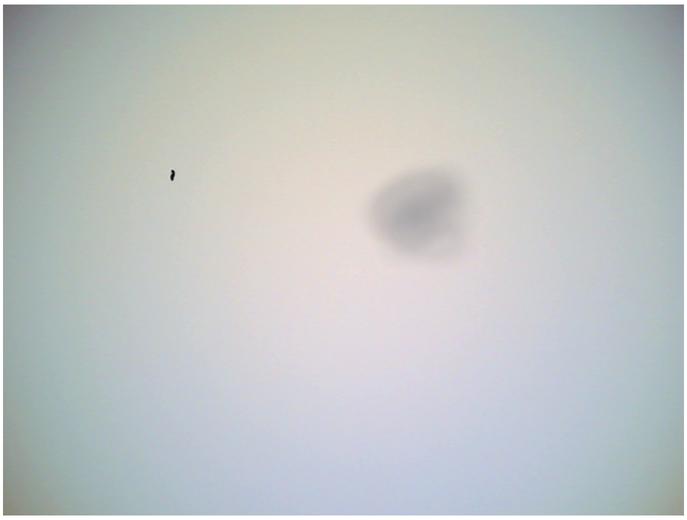


Figure 59 Effects of dust on optical path

If large dust particles get trapped on top of the lens surface in the cavity between the camera window and the lens, they will cause image blurring and poor contrast. If dust stays on the camera module surface, camera cussion, camera bezel or window at assembling, dust may sneak into the optical system as the optical zoom or Auto focus lens moves back and forth. The camera cussion and bezel between the window and the lens unit or camera module should prevent any particles from getting into the cavity after the manufacturing phase.

If dust particles are found on the sensor, this is classified as a manufacturing error of the module, and the camera should be replaced. Any particles inside the cavity between the protection window and the lens have most probably been trapped there in the assembly phase at a Nokia factory. Unauthorized disassembling of the product can also be the root of the problem. However, in most cases it should be possible to remove the particle(s) by using clean compressed air. Never wipe the lens surface before trying compressed air; the possibility of damaging the lens is substantial. Always check the image sharpness after removing dust.

Testing camera image sharpness

Symptoms and diagnosis

If pictures taken with a device are claimed to be blurry, there are six possible sources for the problem:

1 The protection window is fingerprinted, soiled, dirty, visibly scratched or broken.

2 The photographed object is too close – the camera lens operates with distances from 40 cm to infinity. This is no cause to replace camera module.

3 User has tried to take pictures in too dark conditions, and images are blurred due to handshake or movement. This is no cause to replace camera module.

4 There is dirt between the protection window and camera lens.

5 The protection window is defective. This can be either a manufacturing failure or caused by the user. The window should be changed.

6 The camera lens is misfocused because of a manufacturing error.

A quantitative analysis of sharpness is very difficult to conduct in any other environment than optics laboratory. Therefore, subjective analysis should be used.

If no visible defects (items 1-4) are found, a couple of test images should be taken. Generally, a well-illuminated typical indoor scene can be used as a target. The main considerations are:

- The protection window has to be clean.
- The amount of light (300 – 600 lux (bright office lighting)) is sufficient.
- The scene should contain, for example, small objects for checking sharpness. Their distance should be 1 – 2 meters.
- If possible, compare the image to another image of the same scene, taken with a different device. Note that the reference device has to be a similar Nokia phone.

Steps

1. Take several images of small objects in the distance of 1-2 metres.
2. Analyse the images on a PC screen at 100% scaling with the reference images.

   Pay attention to the computer display settings: at least 65000 colors (16-bit) have to be used. True colour (24-bit, 16 million colours) or 32-bit (full colour) setting is recommended.

Next actions

If there appears to be a clearly noticeable difference between the reference image and the test images, the module might have a misfocused lens -> change the module.

Re-check the resolution after changing the camera module.

If the changed module produces the same result, the fault is probably in the camera window. Check the window by looking carefully through it when replacing the module.

Dirty camera lens protection window

The following series of images demonstrates the effects of fingerprints on the camera protection window.

It should be noted that the effects of any dirt in images can vary much. It may be difficult to judge whether the window has been dirty or if something else is wrong. Therefore, the cleanness of the protection window should always be checked and the window should be wiped clean with a suitable cloth.

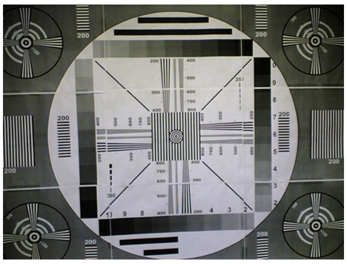
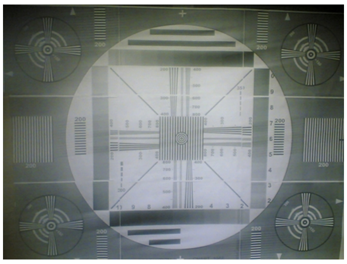
 **Figure 60 Image taken with clean protection window**	 **Figure 61 Image taken with greasy protection window**

Image bit errors

Bit errors are image defects caused by data transmission errors between the camera module and the phone baseband and/or errors inside the module.

Usually bit errors can be easily detected in images, and they are best visible in full resolution images. A good practice is to use a uniform white test target when analysing these errors. The errors are clearly visible, colourful sharp dots or lines in camera images. See the following figure.

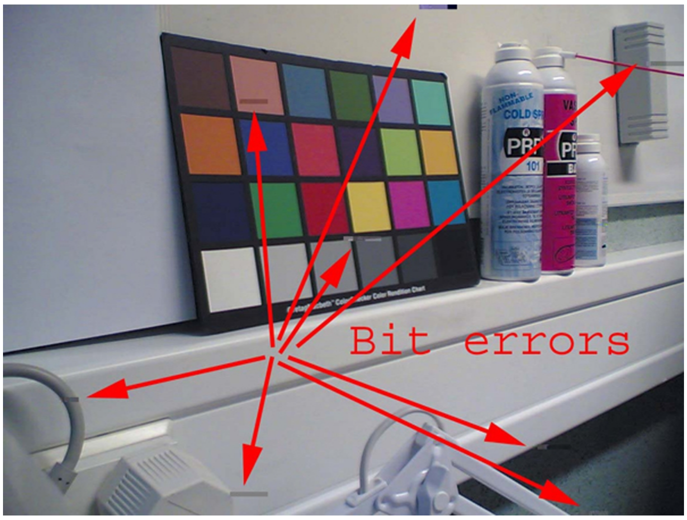


Figure 62 Bit errors caused by JPEG compression

One type of bit error is a lack of bit depth. In this case, the image is almost totally black under normal conditions, and only senses something in very highly illuminated environments. Typically this is a contact problem between the camera module and the phone main PWB. You should check the camera assembly and connector contacts.

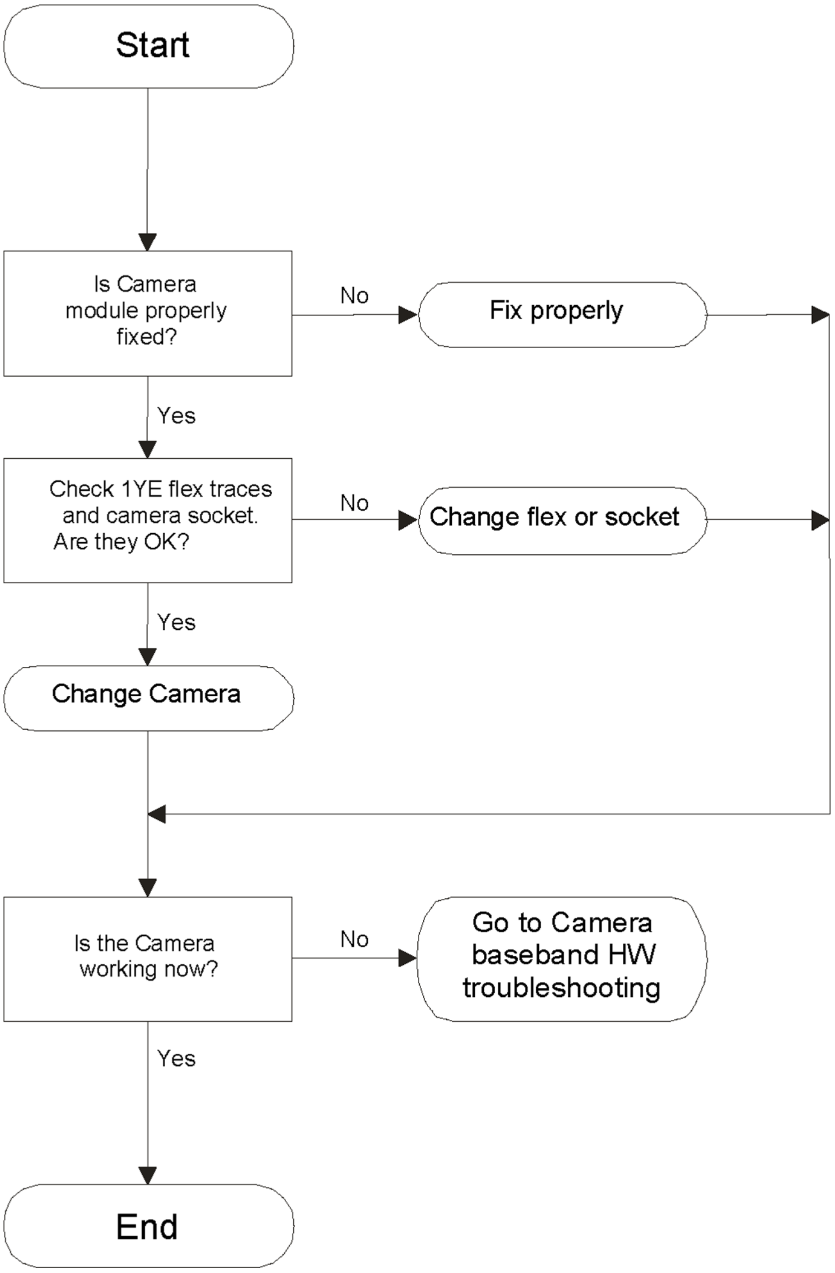
If the fault is in the camera module, bit errors are typically visible only when using some specific image resolution. For example, in case of a viewfinder fault, the error might exist but is not visible in a full size image.

> **Note:** At the most 5 clusters of black dots or blemish are not considered errors, and no reason to replace camera module

Camera troubleshooting flowcharts

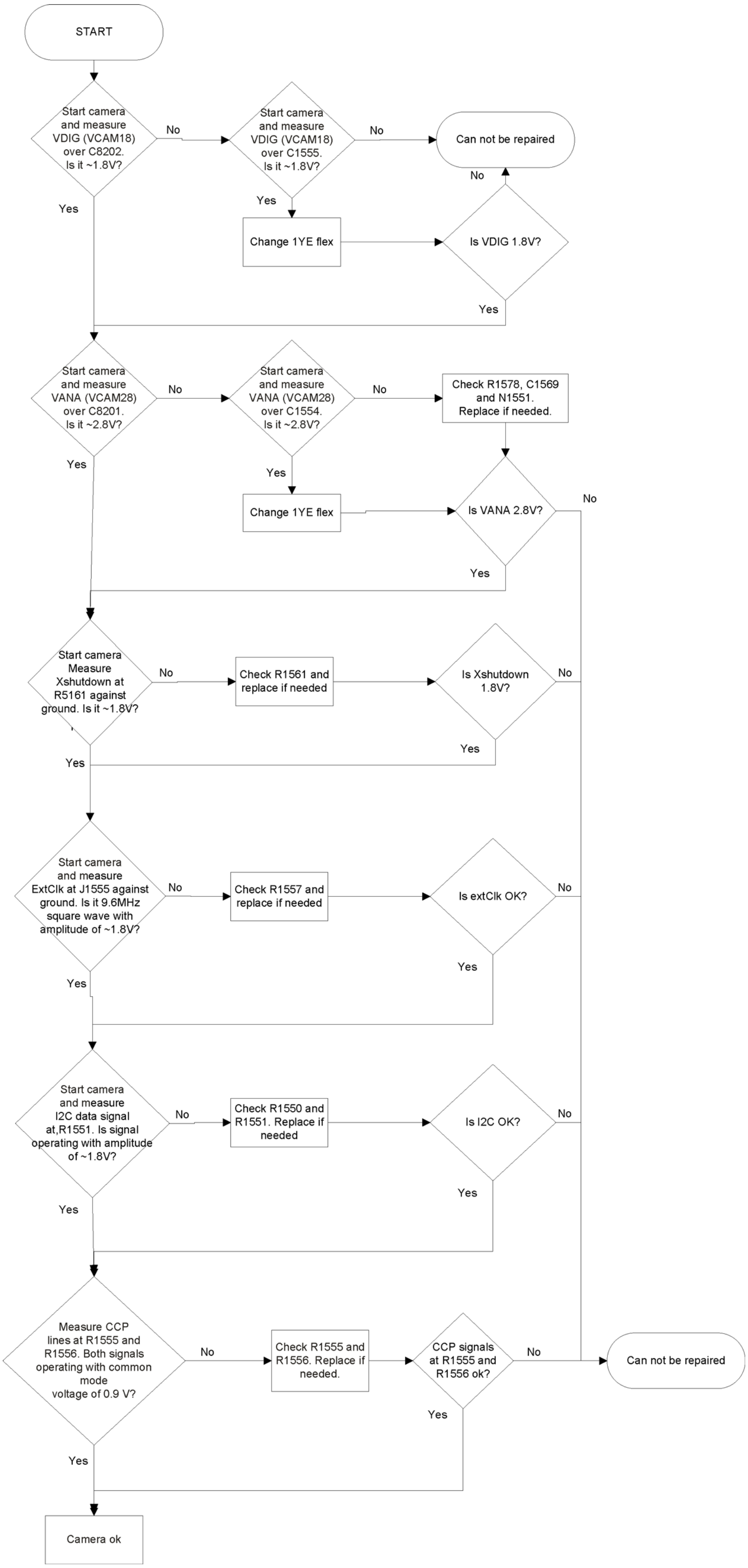
Camera hardware failure message troubleshooting

Troubleshooting flow


Start
Is Camera module properly fixed?
No
Fix properly
Yes
Check 1YE flex traces and camera socket. Are they OK?
No
Change flex or socket
Yes
Change Camera
Is the Camera working now?
No
Go to Camera baseband HW troubleshooting
Yes
End

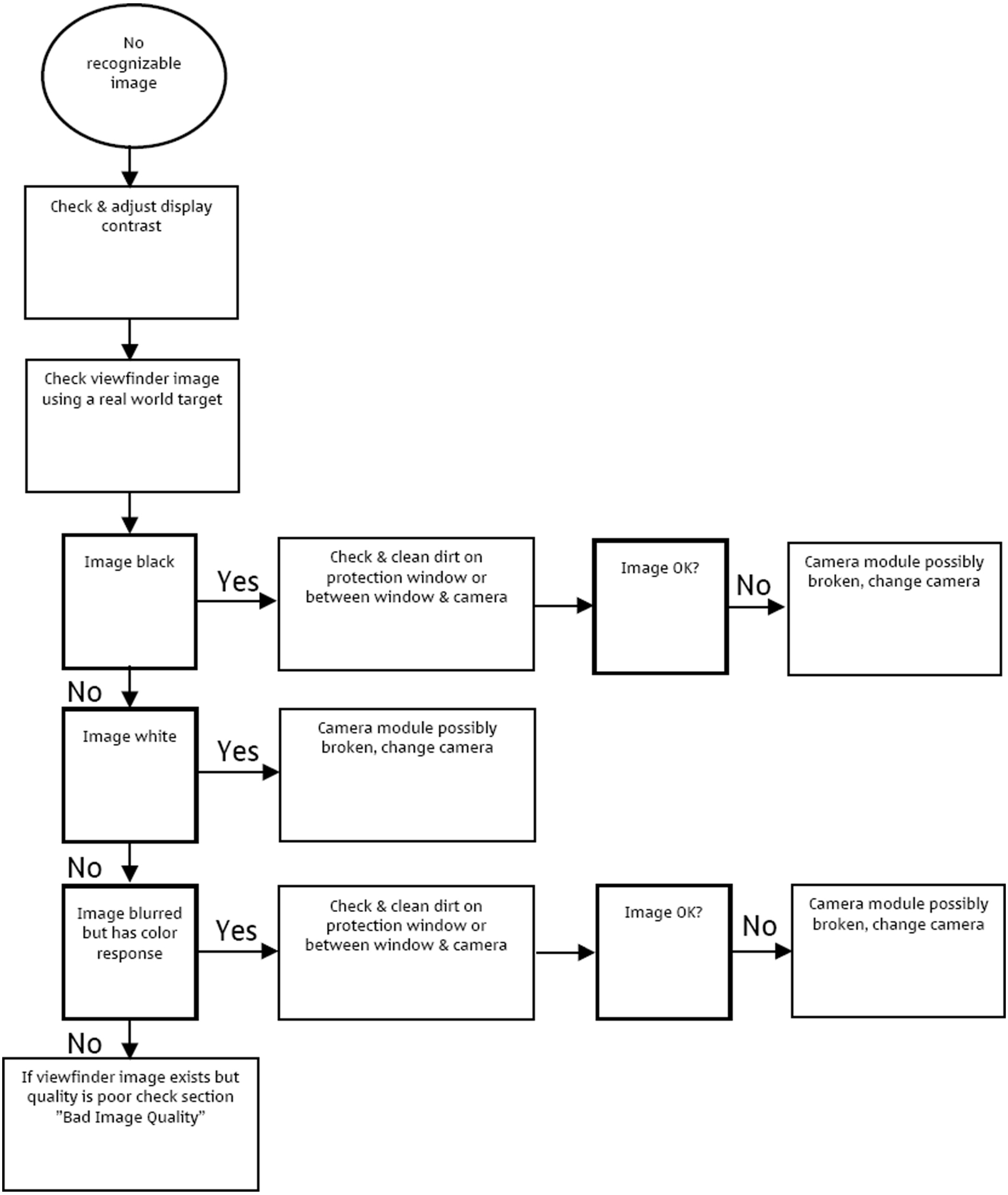
Camera baseband hardware troubleshooting

Troubleshooting flow


START
Start camera and measure VDIG (VCAM18) over C8202. Is it ~1.8V?
No
Start camera and measure VDIG (VCAM18) over C1555. Is it ~1.8V?
No
Can not be repaired
Yes
Yes
Change 1YE flex
Is VDIG 1.8V?
No
Yes
Start camera and measure VANA (VCAM28) over C8201. Is it ~2.8V?
No
Start camera and measure VANA (VCAM28) over C1554. Is it ~2.8V?
No
Check R1578, C1569 and N1551. Replace if needed.
Yes
Yes
Change 1YE flex
Is VANA 2.8V?
No
Yes
Start camera Measure Xshutdown at R5161 against ground. Is it ~1.8V?
No
Check R1561 and replace if needed
Is Xshutdown 1.8V?
No
Yes
Yes
Start camera and measure ExtClk at J1555 against ground. Is it 9.6MHz square wave with amplitude of ~1.8V?
No
Check R1557 and replace if needed
Is extClk OK?
No
Yes
Yes
Start camera and measure I2C data signal at,R1551. Is signal operating with amplitude of ~1.8V?
No
Check R1550 and R1551. Replace if needed
Is I2C OK?
No
Yes
Yes
Measure CCP lines at R1555 and R1556. Both signals operating with common mode voltage of 0.9 V?
No
Check R1555 and R1556. Replace if needed.
CCP signals at R1555 and R1556 ok?
No
Can not be repaired
Yes
Yes
Camera ok

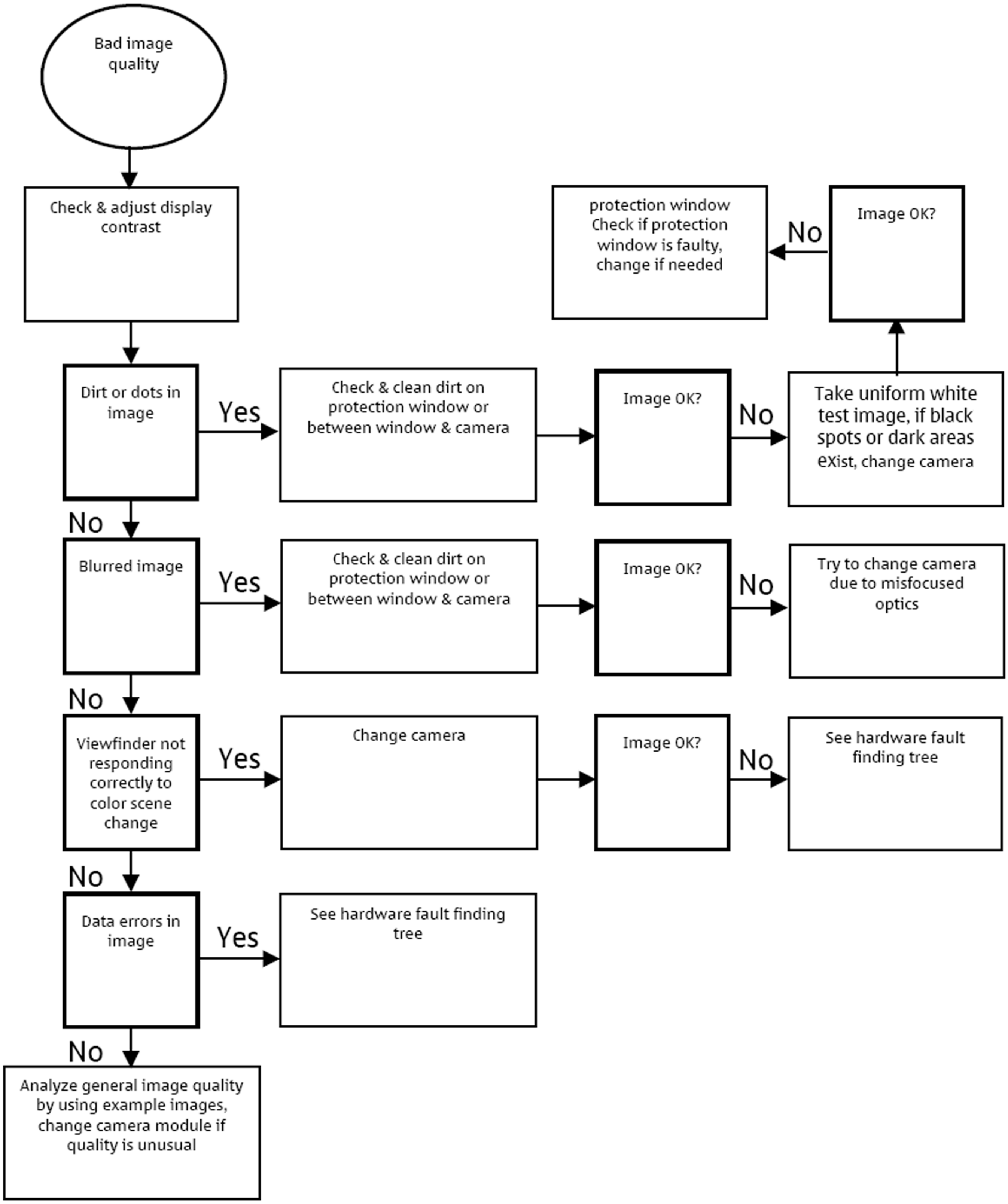
Front camera viewfinder troubleshooting

Troubleshooting flow


No recognizable image
Check & adjust display contrast
Check viewfinder image using a real world target
Image black
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Camera module possibly broken, change camera
No
Image white
Yes
Camera module possibly broken, change camera
No
Image blurred but has color response
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Camera module possibly broken, change camera
No
If viewfinder image exists but quality is poor check section "Bad Image Quality"

Front camera bad image quality troubleshooting

Troubleshooting flow


Bad image quality
Check & adjust display contrast
Dirt or dots in image
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Take uniform white test image, if black spots or dark areas exist, change camera
Image OK?
No
protection window Check if protection window is faulty, change if needed
No
Blurred image
Yes
Check & clean dirt on protection window or between window & camera
Image OK?
No
Try to change camera due to misfocused optics
No
Viewfinder not responding correctly to color scene change
Yes
Change camera
Image OK?
No
See hardware fault finding tree
No
Data errors in image
Yes
See hardware fault finding tree
No
Analyze general image quality by using example images, change camera module if quality is unusual

9 — System Module

(This page left intentionally blank.)

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Baseband description

System module block diagram

The device consists of 5 modules: 1yb engine module, 1yc Ui flex module, 1yd T9 flex module, 1ye camera sidekey flex module and 1yf SIM card flex module. The transceiver board consists of baseband and RF components.

The UI flex module consists of S60 keypad and backlight, ALS, display connector, earpiece pads and power switch. T9 flex module consists of T9 keypad and EL illumination. Camera sidekey flex module consist of Camera, 4 sidekeys and IHF speaker pads. SIM card flex module consists of SIM and uSD card connectors.

Note: In this description, user interface HW covers display, keyboard, keyboard backlight and ALS.

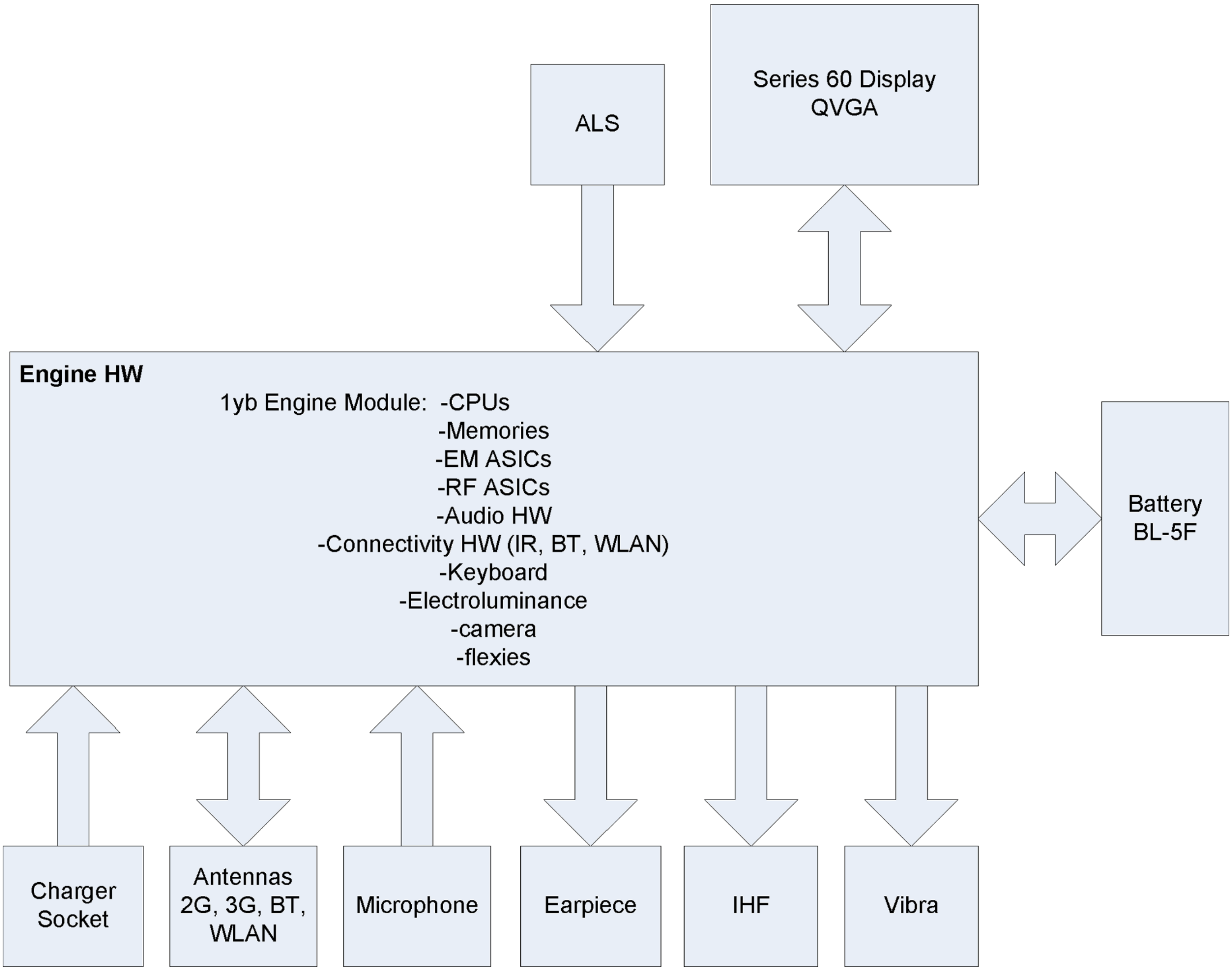

ALS
Series 60 Display
QVGA
Engine HW
1yb Engine Module: -CPUs
-Memories
-EM ASICs
-RF ASICs
-Audio HW
-Connectivity HW (IR, BT, WLAN)
-Keyboard
-Electroluminance
-camera
-flexies
Battery
BL-5F
Charger
Socket
Antennas
2G, 3G, BT,
WLAN
Microphone
Earpiece
IHF
Vibra

Figure 63 System level block diagram

Baseband functional description

Digital baseband consists of ISA based modem and SYMBIAN based application sections. Modem functionality is in RAP3GS and application processor acts as a platform for SYMBIAN applications.

Modem section consists of RAP3GS ASIC with NOR FLASH and DDRAM memory as the core. Memory package POP2 is stacked on to RAP3GS. RAP3GS supports cellular protocols of WCDMA (3GPP R-4) and GSM (minimum EDGE glass 10, GPRS phase2). Modem DDRAM memory have 128Mbits of memory and NOR flash have 128Mbits of memory. RAP3G operates with the system clock of 38.4 MHz, which comes from the VCTCXO.

Application section includes application processor ASIC with DDR/NAND combo memory as the core. Application processor uses 19.2MHz clock, which comes from the RAP3GS divided by two from the 38.4 MHz system clock.

Application processor (OMAP1710) is also called as an application ASIC because it is processing application SW and handles the UI SW. It consists of OMAP3.3 and peripheral subsystems like display- and keyboard driver blocks.

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during charging is active
Battery voltage (Call)	+3.2		+4.3	V	Battery voltage maximum value is specified during charging is active
Charger input voltage	-0.3		+20	V	
Back-Up supply voltage	0	2.5	2.6	V	Maximum capacity of the backup power supply assumed to be 4 µAh.

Phone modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below VILMA master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over VILMA master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the systems activity is low. There are in principle three different sleep modes: • Helen3 sleep • RAP3GS sleep • Helen3 and RAP3GS sleep (deep sleep)

Mode	Description
FLASHING	FLASHING mode is for SW downloading.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (N2300)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.2V

The master reset threshold controls the internal reset of N2200 / (N2300). If battery voltage is above VMSTR, N2300's charging control logic is alive. Also, RTC is active and supplied from the main battery. Above VMSTR, N2300 allows the system to be powered on although this may not succeed due to voltage drops during start up. SW can also consider battery voltage too low for operation and power down the system.

Power key

The system boots up when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). Power on key is connected to N2200 ASIC via PWRONX signal.

Power distribution

Power supply components:

- EM ASIC N2200
- EM ASIC N2300
- Application processor VCORE SMPS
- BT
- LDO
- backlight SMPS
- EL-driver
- MicroSD level shifters
- Camera regulators

All the above are powered by the main battery voltage.

Battery voltage is also used on the RF side for power amplifiers (GSM PA & WCDMA PA) and for RF ASIC (N7590, AHNEUS).

Discrete power supplies are used to generate 2.8V to BT, 1.8 V and 2.8 V for camera HW accelerator and camera, 1.05V/1.4V for Application processor and 18V for the backlight LEDs.

The device supports both 1.8V/3V SIM cards which are powered by EM ASIC N2200 / VSIM1. Level shifters are used to power microSD. USB accessories which need power from the device are powered by EM ASIC N2300 / VOUT.

External LED SMPS is still controlled by EM ASIC N2300 PWM300 and powered by battery voltage.

System power-up

After inserting the main battery, regulators started by HW are enabled. SW checks, if there is some reason to keep the power on. If not, the system is set to power off state by watchdog. Power up can be caused by the following reasons:

- T0: Power key is pressed
- Charger is connected
- RTC alarm occurs
- MBUS wake-up

Clocking scheme

There are two main clocks in the system: a 38.4 MHz RF clock produced by VCTCXO in the RF section, and a 32.768 kHz sleep clock produced by EM ASIC N2200 with an external crystal.

The RF clock is generated only when VCTCXO is powered on by an N2200 regulator. The regulator itself is activated by SleepX signals from both RAP and the application processor. When both CPUs are on sleep, the RF clock is stopped.

The RF clock is used by RAP that then provides (divided) 19.2 MHz SysClk further to the application processor. Both RAP and the application processor have internal PLLs, which then create clock signals for other peripheral devices/interfaces like memory card, SIM, CCP, I2C and memories.

32k Sleep Clock is always powered on after startup. Sleep clock is used by RAP and the application processor for low-power operation.

SMPS Clk is a 2.4 MHz clock line from RAP to EM ASIC N2300 used for switch mode regulator synchronizing in the active mode. In the deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

BT Clk is a 38.4 MHz signal from a different BT/WLAN VCTCXO G6030 to the Bluetooth system.

CLK600 is a 600 kHz signal from N2300 to APE VCORE SMPS. The clock source is an internal RC oscillator in N2300 (during the power-up sequence) or RAP SMPS Clk divided by 4 after the power-up sequence.

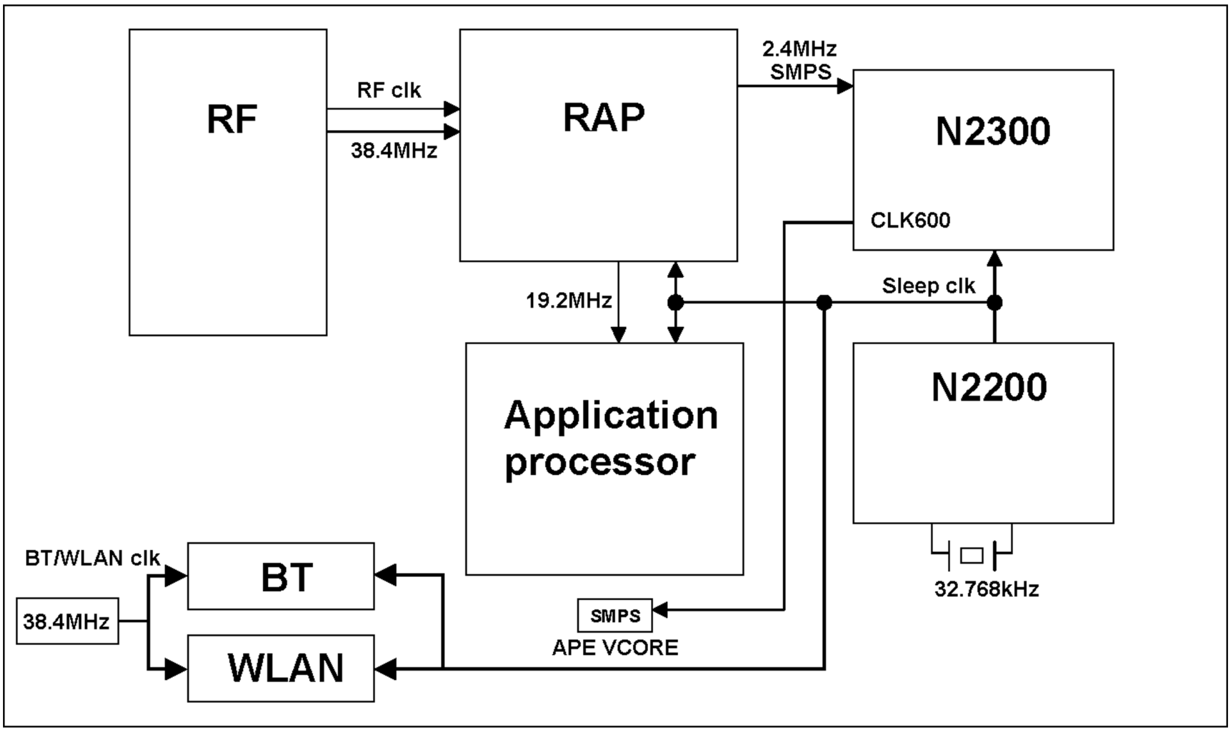


Figure 64 Clocking scheme

IrDA

IrDA specifies a low-cost, reliable, fully digital peer-to-peer data link between IrDA units at data rates from 9600 bits/s to 115 kbit/s. The link is based on the serial transmission of data as pulses of infra red light at the wave length of 870nm and angles of +-15degrees at the range 0 - 50 to 100 cm. Because these restrictions and the optical nature of the link, the transmission is not omnidirectional but focused and only reaches a peer at a limited line-of-sight distance from the transmitter thus not disturbing any other units in the neighbourhood.

Baud rates in the range 9600 bit/s to 115 kbit/s are known as SIR (Slow IR); this data is sent asynchronously. The protocol and speed are only changed after successful negotiation. IrDA connectivity includes IrCOMM, IrOBEX, IrTran-P, IrMC and PhoNet.

IR communication is half-duplex e.g. the IR receiver sees its own transmission, and the IR interface is either transmitting or receiving, but not both at once. IrDa modules consume current when the IR detector is active and therefore modules have to be set to the shutdown mode (SD-mode).

USB

USB (Universal Serial Bus) provides a wired connectivity between a USB host PC and peripheral devices.

USB is a differential serial bus for USB devices. USB controller supports USB specification revision 2.0 with full speed USB (12 Mbps). The device is connected to the USB host through the system connector. The USB bus is hot plugged capable, which means that USB devices may be plugged in/out at any time.

Hall sensor

HALL sensor is used to monitor the position of the upper block in slide construction.

The function of a Hall sensor is based on the physical principle of the Hall effect. Hall voltage is generated over sensor when magnetic field traverses the sensor.

There is an integrated comparator and switches in Hall switches. When sensor is in magnetic field, switch is closed and output is connected to GND.

Hall sensor detects the slide position. There is a magnet in slide mechanics under the display module and when the slide is closed Hall sensor is in magnetic field.

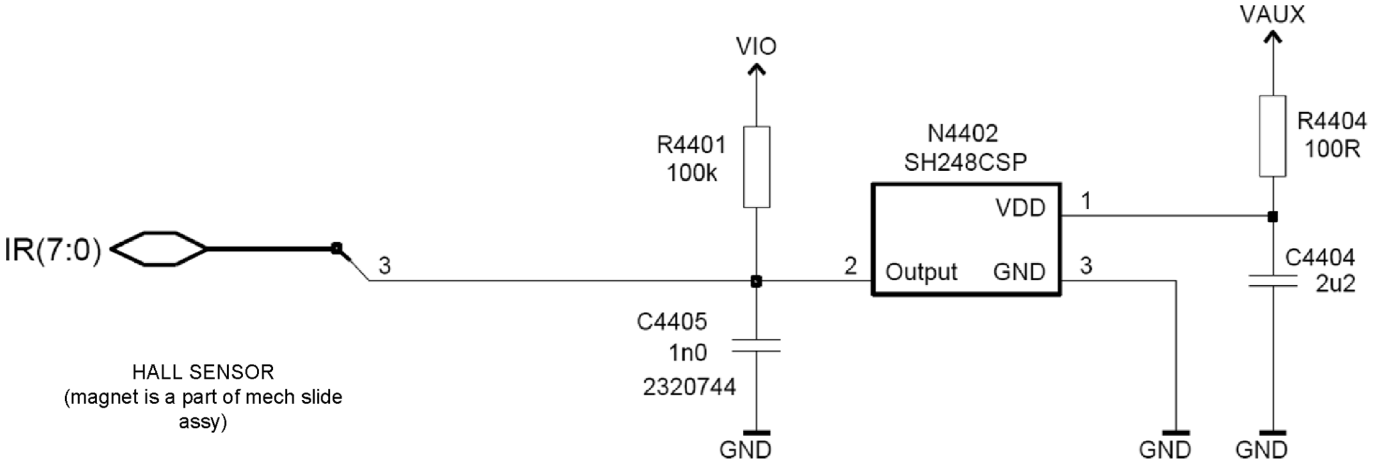

VIO
VAUX
R4401
100k
N4402
SH248CSP
R4404
100R
VDD
1
IR(7:0)
3
2
Output
GND
3
C4404
2u2
C4405
1n0
2320744
HALL SENSOR
(magnet is a part of mech slide assy)
GND
GND
GND

Figure 65 Hall sensor

SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC (N2200), and of an external interface between N2200 and SIM contacts. The main SIM interface functionality is in RAP while the EM ASIC takes care of power up/down, card detection, ATR (Answer To Reset) counting and level shifting.

The SIM IF is shown in the following figure:

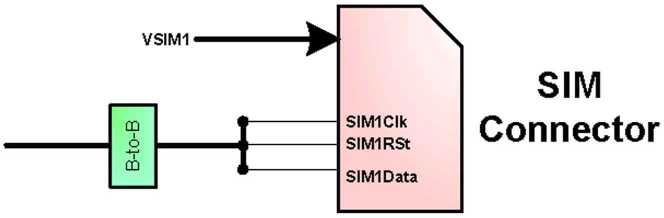

VSIM1
B-to-B
SIM1Clk
SIM1RSt
SIM1Data
SIM
Connector

Figure 66 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based in the BSI line. Because of the location of the SIM card, removing the battery causes a quick power down of the SIM IF.

The EM ASIC SIM1 interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

The data communication between the card and the phone is asynchronous half duplex, and the clock supplied to the card is 1-5 MHz, which is 3.2 MHz by default (in GSM system). The data baud rate is the SIM card clock frequency divided by 372 (by default), 64, 32 or 16.

Battery interface

The battery interface supports a 3-pole battery interface. The interface consists of three connectors: VBAT, BSI and GND.

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

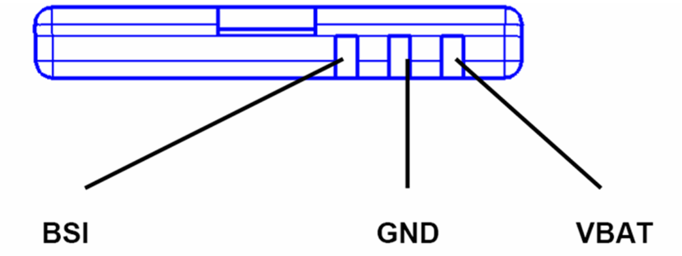

BSI
GND
VBAT

Figure 67 Battery pin order

MicroSD interface

The MicroSD card interface is electrically and functionally compatible with SD card interface.

MicroSD card interface is a 4-bit serial IF connected to application processor. IF includes 1.8V-2.85V level shifter, 2.85V LDO regulator and ASIP (combined into one package) . There is an internal switch in the card reader for card presence and removal detection.

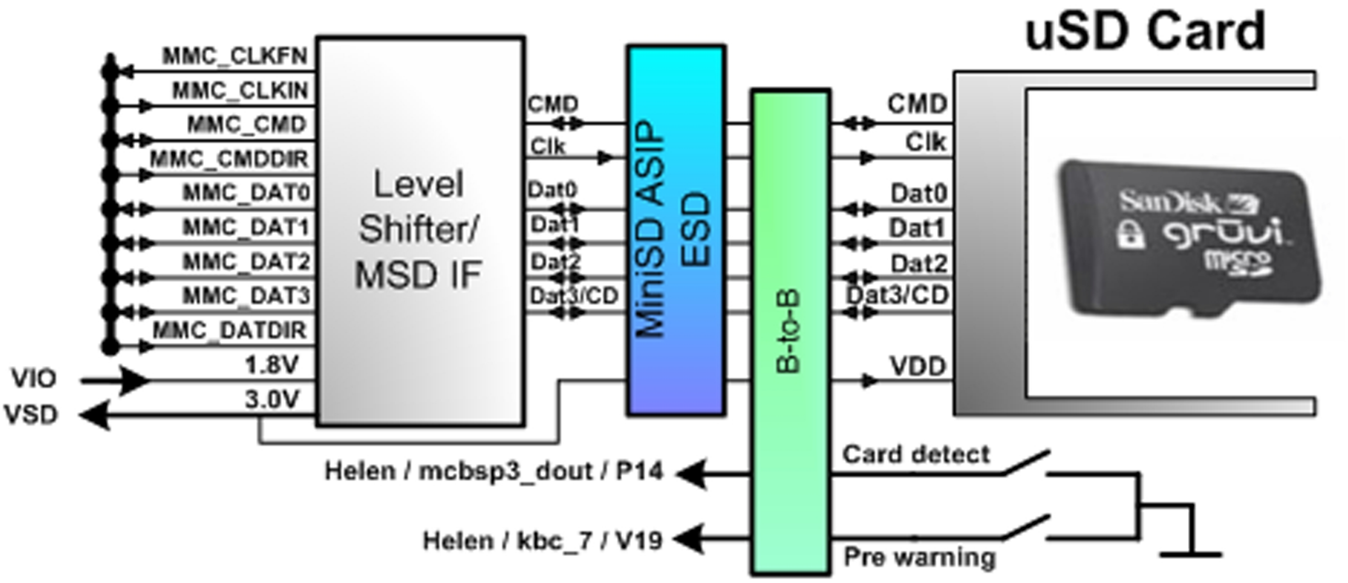

uSD Card
MMC_CLKFN
MMC_CLKIN
MMC_CMD
MMC_CMDDIR
MMC_DAT0
MMC_DAT1
MMC_DAT2
MMC_DAT3
MMC_DATDIR
1.8V
3.0V
VIO
VSD
Level Shifter/ MSD IF
CMD
Clk
Dat0
Dat1
Dat2
Dat3/CD
MiniSD ASIP ESD
B-to-B
CMD
Clk
Dat0
Dat1
Dat2
Dat3/CD
VDD
Card detect
Pre warning
Helen / mcbsp3_dout / P14
Helen / kbc_7 / V19

Figure 68 MicroSD card interface

Table 19 MicroSD interface

Pin	signal	I/O	Engine connection	Notes
1	DAT2	<->	N5200	
2	CD/DAT3	<->	N5200	
3	CMD	<->	N5200	
4	VDD	->	N5200	
5	CLK	<->	N5200	

Pin	signal	I/O	Engine connection	Notes
6	GND			
7	DAT0	<->	N5200	
8	DAT1	<->	N5200	
9	SW1	->	Application processor	Card presence
10	GND			Card removal switch ground
10	SW2	->	Helen3	Card insertion/ removal

Camera interface

Camera is located on camera flex and camera HW accelerator is located on engine module.

HWA is connected to OMAP 1710 and the data is transferred from camera using CCP bus.

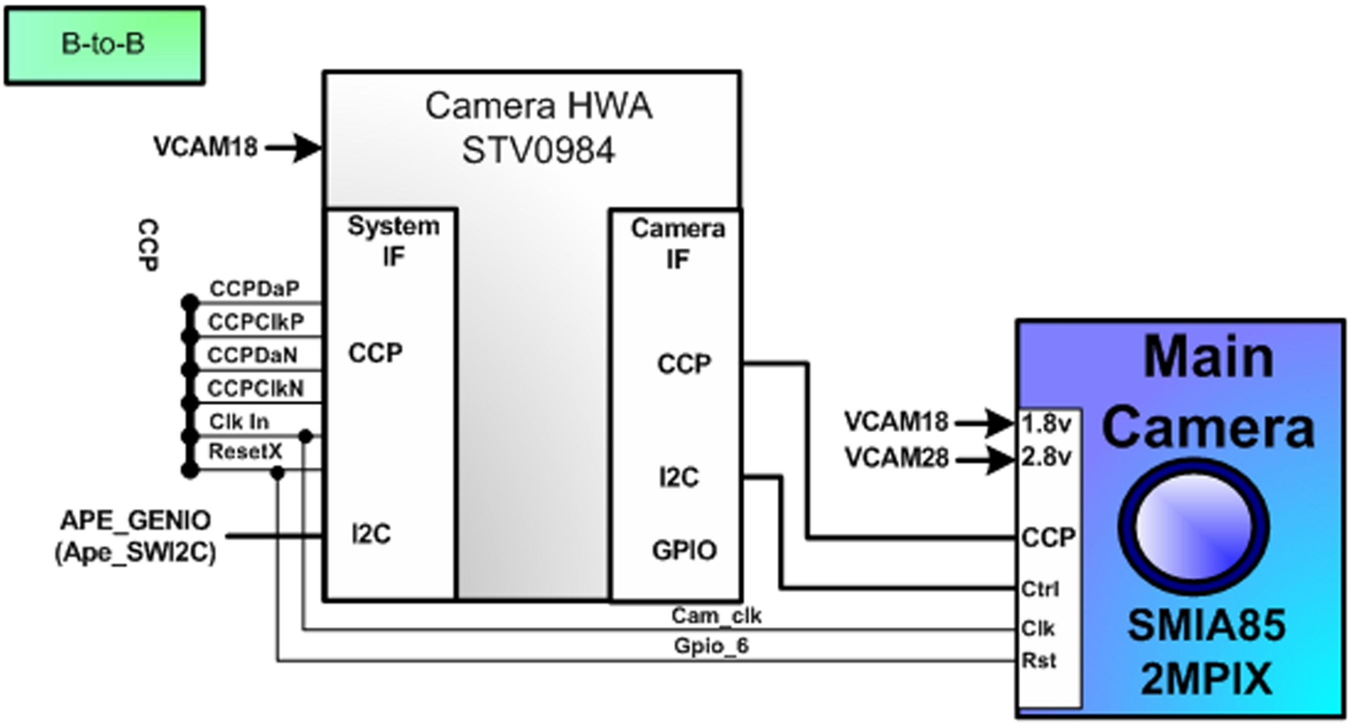

B-to-B
Camera HWA
STV0984
VCAM18
CCP
System IF
CCP
I2C
Camera IF
CCP
I2C
GPIO
CCPDaP
CCPClkP
CCPDaN
CCPClkN
Clk In
ResetX
APE_GENIO
(Ape_SWI2C)
Cam_clk
Gpio_6
VCAM18
VCAM28
1.8v
2.8v
CCP
Ctrl
Clk
Rst
Main
Camera
SMIA85
2MPIX

Figure 69 Camera interface

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit and one or more slave units. The system provides a radio link that offers a high degree of flexibility to support various applications and product scenarios. Data and control interface for a low power RF module is provided. The data rate is regulated between the master and the slave.

The device Bluetooth is based on the BC3 BT ASIC.

The UART1 interface handles the transfer of control and data information between the application processor and the BT system.

The PCM interface is used for audio data transfer between RAP and the BT system.

TI BRF 6150 ROM is a low power Bluetooth RF-tranceiver module meeting Bluetooth compatibility standards (Class 2 Bluetooth v1.2 compliant pre-qualified tranceiver system) and has the BTH/WLAN physical co-existence interface for Nokia application.

BRF 6150 is a single chip Bluetooth device appropriate for use in Nokia mobile phone applications, where the Nokia BB acts as a Bluetooth host interface.

Interface to RAP3G

The baseband uses RAP3G as the cellular ASIC and Helen3 as the Application processor.

This is because the BT application program runs on the Application processor in Symbian OS environment. Audio (PCM Interface) is still connected to the cellular ASIC such that cellular audio delay is kept minimum.

The Nokia BB and BRF 6150 interface can be logically divided into audio, user data and control Interfaces.

Audio interface

Audio data is transferred using a separate interface based on PCM (Sync, In, Out, Clk).

The interface is configured by MCU software but the data transfer is done by the DSP.

Audio data is based on 8kHz sampling data – same as that used in the cellular system. The used configuration is as shown below:

Master/Slave	TI as Slave
Clock	Nokia BB ASIC generates PCM_CLK
Data width	16 bits PCM_out
Sync. Frame	Short PCM_Sync
Coding	PCM Linear

WLAN interface CXS

Coexistence Signaling Interface [CXS] between BTH and WLAN modules is to facilitate collocation in a terminal that has BTH and WLAN.

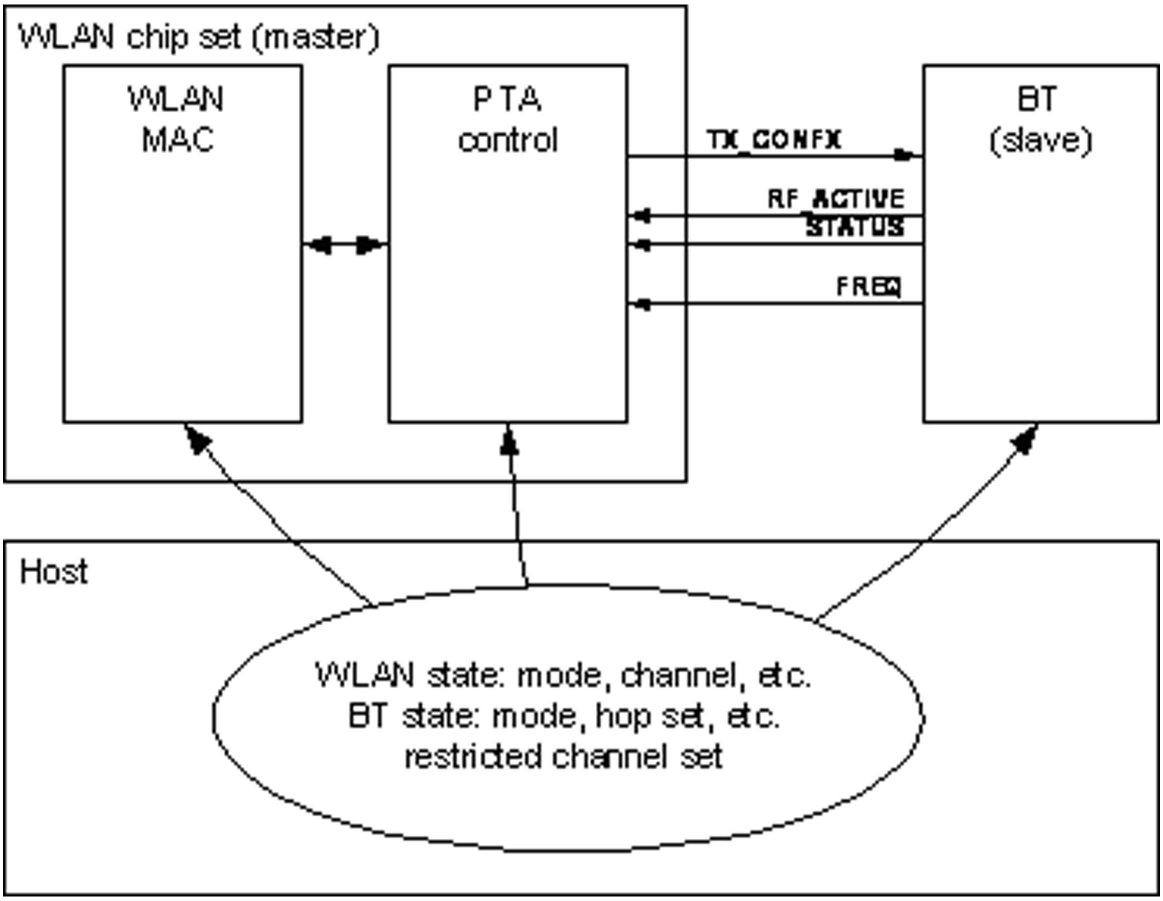

WLAN chip set (master)
WLAN MAC
PTA control
BT (slave)
TX_CONFX
RF_ACTIVE
STATUS
FREQ
Host
WLAN state: mode, channel, etc.
BT state: mode, hop set, etc.
restricted channel set

Figure 70 BT-WLAN coexistence framework

System partitioning

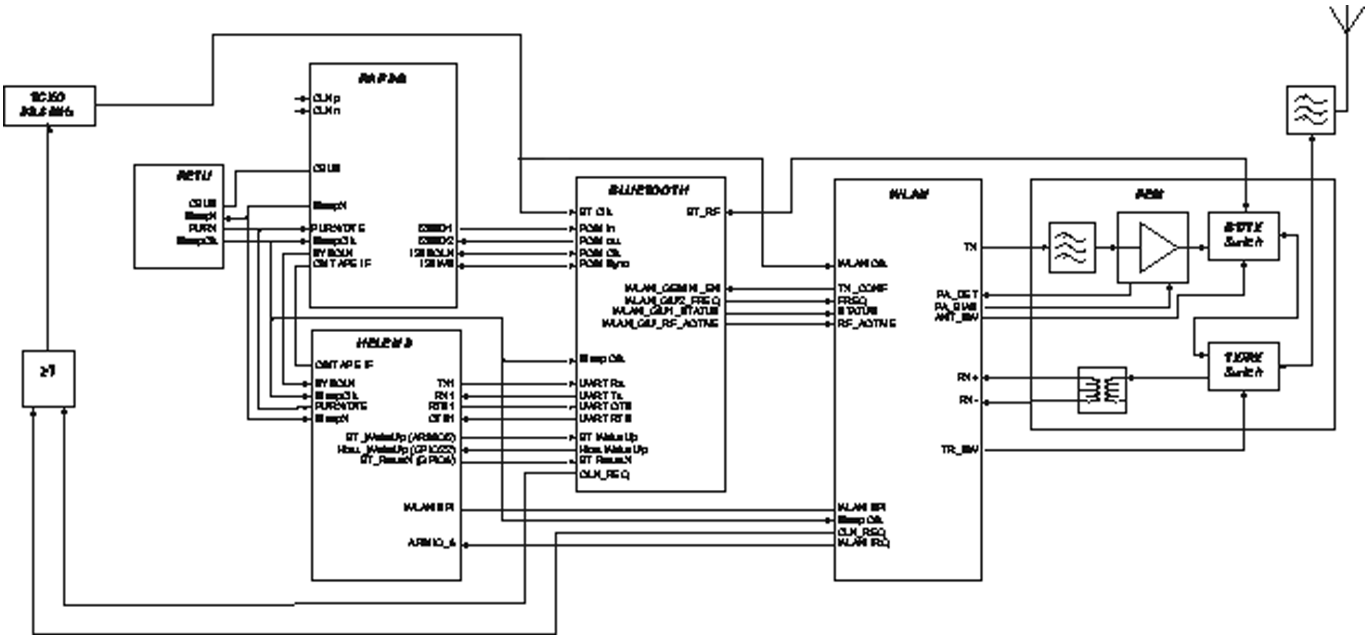

CLKp
CLKn
RETU
PURX
SleepX
SleepClk
BLUETOOTH
BT Clk
BT_RF
PCM In
PCM Out
PCM Clk
PCM Sync
TX_CONF
FREQ
STATUS
RF_ACTIVE
Sleep Clk
UART Rx
UART Tx
UART CTS
UART RTS
BT Wake Up
Host Wake Up
BT ResetX
CLK_REQ
WLAN
WLAN Clk
WLAN SPI
Sleep Clk
CLK_REQ
WLAN IRQ
ARMIO_4
TX
PA_DET
PA_BIAS
ANT_SW
RX+
RX-
TR_SW
Switch
Switch

Figure 71 BT-WLAN system partitioning

The interface between BRF 6150 and Nokia BB assumes that all higher layers above the HCI (host controller interface) are implemented in Nokia BB and all other layers (BB, Link Manager, Link Control, and component RF) below the HCI are implemented in BRF 6150.

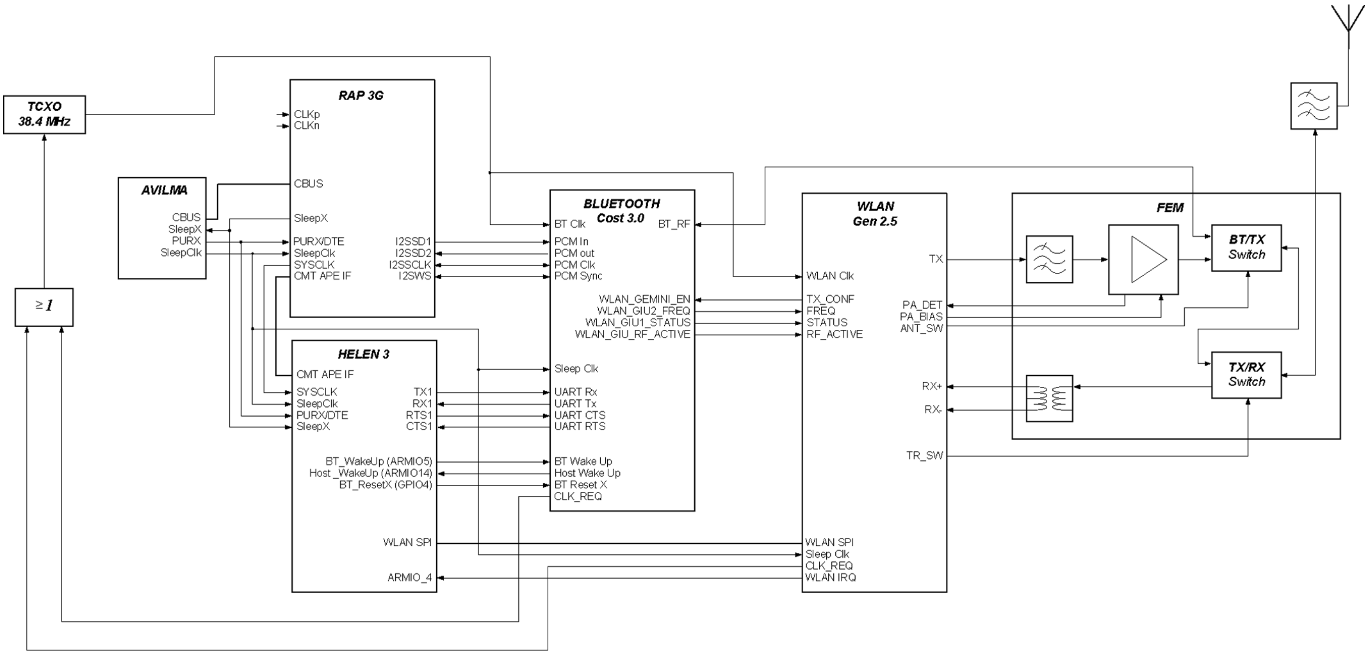
Clock signals

BRF 6150 requires a system clock, which it uses to derive all its internal timing. The clock may be sinusoidal or square and the frequency tolerance is +/-20 ppm. The external TCXO clock oscillator is used for the system clock with a sinusoidal output.

WLAN

STMicroelectronics STLC4550 implements 802.11b/g WLAN radio for embedded, low-power and small form factor mobile applications.

RFMD RF5924 Front-End Module (FEM) is a single integrated module. The FEM has integrated b/g power amplifier, power detector, RX balun and TX filtering.


TCXO
38.4 MHz
≥ 1
AVILMA
CBUS
SleepX
PURX
SleepClk
RAP 3G
CLKp
CLKn
CBUS
SleepX
PURX/DTE
SleepClk
SYSCLK
CMT APE IF
I2SSD1
I2SSD2
I2SSCLK
I2SWS
HELEN 3
CMT APE IF
SYSCLK
SleepClk
PURX/DTE
SleepX
TX1
RX1
RTS1
CTS1
BT_WakeUp (ARMIO5)
Host _WakeUp (ARMIO14)
BT_ResetX (GPIO4)
WLAN SPI
ARMIO_4
BLUETOOTH
Cost 3.0
BT Clk
BT_RF
PCM In
PCM out
PCM Clk
PCM Sync
WLAN_GEMINI_EN
WLAN_GIU2_FREQ
WLAN_GIU1_STATUS
WLAN_GIU_RF_ACTIVE
Sleep Clk
UART Rx
UART Tx
UART CTS
UART RTS
BT Wake Up
Host Wake Up
BT Reset X
CLK_REQ
WLAN
Gen 2.5
WLAN Clk
TX_CONF
FREQ
STATUS
RF_ACTIVE
TX
PA_DET
PA_BIAS
ANT_SW
RX+
RX-
TR_SW
WLAN SPI
Sleep Clk
CLK_REQ
WLAN IRQ
FEM
BT/TX
Switch
TX/RX
Switch

WLAN BB/MAC

The baseband chip implements OFDM/CCK digital baseband processor and ARM9-based MAC with internal SRAM memories.

Regulators

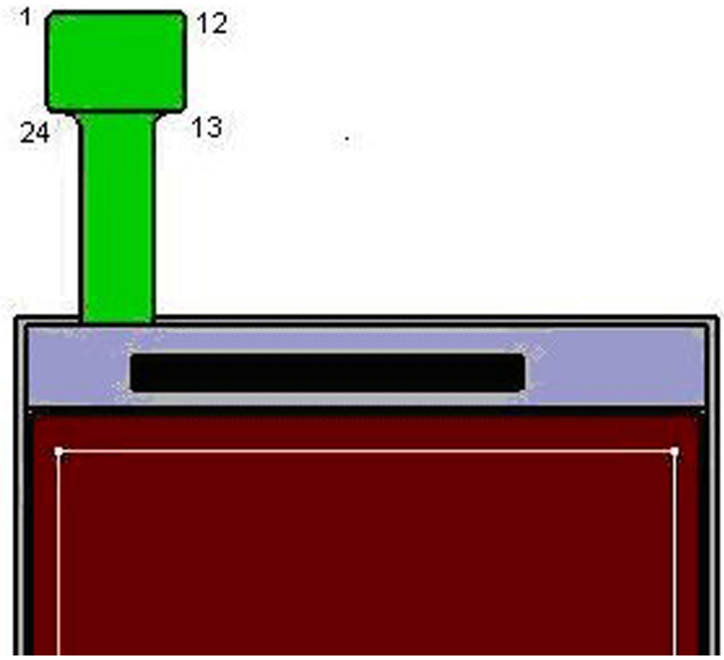
Switching stepdown regulator generates the MAC/BB digital core supply at 1.2 V.

Two separate LDOs at 1.8 V output supply the VCO and the transceiver. The main 1.8 V supply is used for transceiver analog parts, ADC/DAC and digital circuits inside the transceiver.

User interface

Display interface

Display module mechanical concept - front



Display features:

The display is an S60 display module CG-Siligon Active matrix color LCD. It is capable of showing 16,777,216 colours. It incorporates a backlight system with 2 +2 LED serial (display leds are connected in two two-led series).

- Partial display function power saving by pausing display process on part of the screen.
- Built-in RAM capacity 240lines x 320rows x 24bits = 184320bits.

The display has two different operating modes:

1 Normal mode, Full screen, 16M colours

2 Partial mode, 8 colours but only part of the display is active

The interconnection between the LCD module and the Nokia engine is implemented with a 24-pin board-to-board connector.

Display is controlled via MeSSi-8 interface by Helen3. All MeSSi-8 signals go through the EMC filtering ASIPs.

The display module does not require any tunings in service.

Display and keyboard backlight

The device has one LED driver (SMPS) that is used to drive 4 display LEDs and 3 S60 keypad LEDs. The display LEDs are connected in to two LED series.

The TP keyboard backlight is made with Electroluminance. Current adjustment of the driver is done from the display LED branch, and keyboard and function current also depends on the display brightness. In a typical use case, keyboard LEDs are turned ON only in dark ambient lighting conditions.

Control signals for LED driver are:

Table 20 LED driver control signals

	From	Voltage	Function
GenOut1	EM ASIC N2300	0V / 1.8V	EL ON (1.8V)/OFF (0V)
PWM	EM ASIC N2300	PWM 0%-100%, 1.8V	Current PWM control (16 steps)

ALS interface

Ambient Light Sensor (ALS) is located on UI flex in the upper part of the phone. It consists of the following components:

- lightguide (part of the front cover)
- photo detector (V8004 in 1YC)

Information on ambient lighting is used to control the backlights of the phone:

- keypad lighting is switched on only when the environment is dark / dim
- display backlights are dimmed, when the environment is dark / dim

The ambient light sensor itself is a photo IC, which is internally temperature-compensated.

The supply voltage for the ambient light sensor is coming from VAUX via a switch N4404 controlled by EM ASIC N2300 Genio2 GenOUT2.

The output from ALS is current, which is fed to the resistor R2206. N2200 reads the light sensor (LS) results, voltage over resistor R2206 ALS calibration is not possible in the service points.

ALS is serviced by replacing faulty phototransistors.

See **ALS interface** figure.

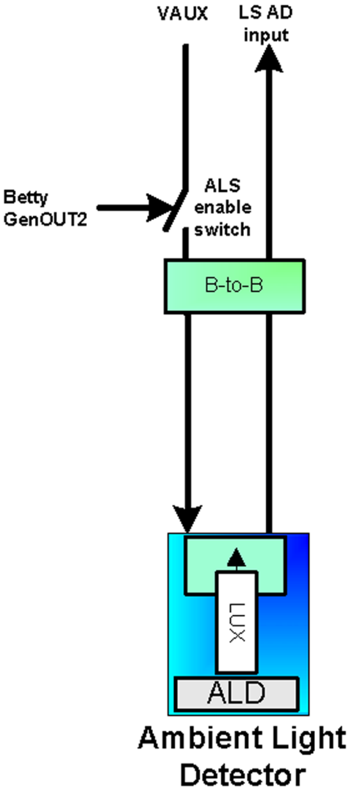

VAUX
LS AD input
Betty GenOUT2
ALS enable switch
B-to-B
LUX
ALD
Ambient Light Detector

Figure 72 ALS interface

ASICs

RAP ASIC

RAP ASIC is a 3G Radio Application Processor. RAM memory is integrated into RAP.

EM ASIC N2200

The EM ASIC (N2200) includes the following functional blocks:

- Start up logic and reset control
- Charger detection
- Battery voltage monitoring
- 32.768kHz clock with external crystal
- Real time clock with external backup battery
- SIM card interface
- Stereo audio codecs and amplifiers
- A/D converter

- Regulators
- Vibra interface
- Digital interface (CBUS)

EM ASIC N2300

The EM ASIC (N2300) includes the following functional blocks:

- Core supply generation
- Charge control circuitry
- Level shifter and regulator for USB/FBUS
- Current gauge for battery current measuring
- Digital interface (CBUS)

Device memories

RAP3GS memory POP2 stacked NOR flash and DDRAM

Modem memory consists of 128 Mbit DDRAM and 128 Mbit NOR flash memories. Memories are in same POP2 package and it is stacked on to RAP3GS.

DDRAM is a dynamic memory for ISA SW.

NOR is used for ISA SW code and PM data and CDSP (Cellular Digital Signal Processor) SW code.

Combo memory

The application memory of the device consists of NAND/DDR combo memory. The stacked DDR/NAND application memory has 512 Mbit of DDR memory and 1024 Mbit of flash memory.

■ Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASICs: RAP 3G CMT engine ASIC and the mixed-signal ASIC EM ASIC N2200.

EM ASIC N2200 provides an interface for the transducers and the accessory connector. Because audio amplifiers are also integrated into EM ASIC N2200, the only discrete electronics components needed for audio paths are audio filtering components and EMC/ESD components.

There are three audio transducers:

- 7x11mm dynamic earpiece
- 20mm dynamic speaker
- electret microphone module

In addition to the audio transducers, EM ASIC N2200 also provides an output for the dynamic vibra component.

All galvanic audio accessories are connected to the Pop-Port™ accessory connector.

A Bluetooth audio module (BC02 BRF 6150) that is connected to RAP3GS supports Bluetooth audio functionality.

There is a separate application ASIC, OMAP 1710, for Symbian applications.

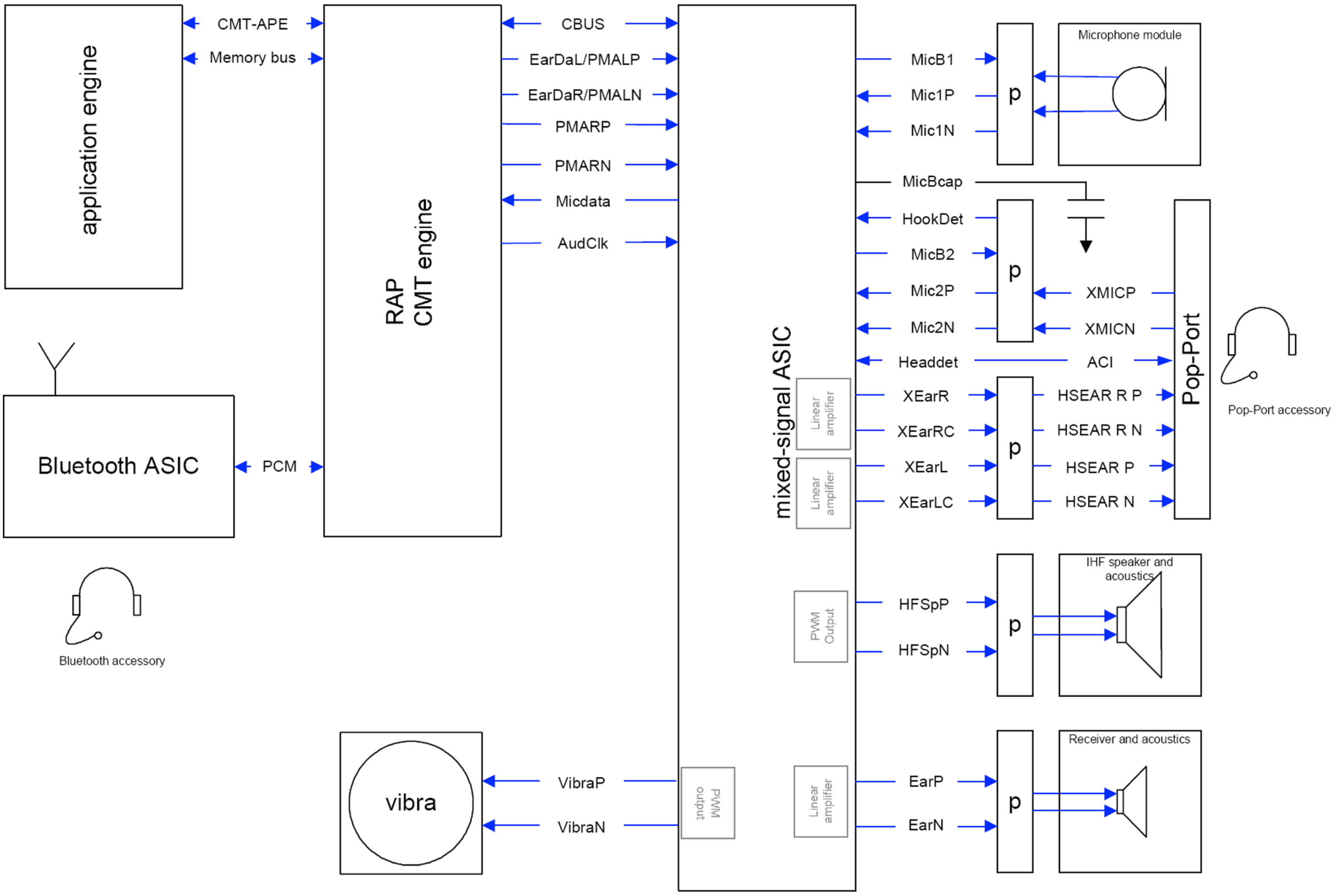

application engine
CMT-APE
Memory bus
RAP
CMT engine
CBUS
EarDaL/PMALP
EarDaR/PMALN
PMARP
PMARN
Micdata
AudClk
mixed-signal ASIC
Linear amplifier
Linear amplifier
PWM Output
PWM output
Linear amplifier
MicB1
Mic1P
Mic1N
MicBcap
HookDet
MicB2
Mic2P
Mic2N
Headdet
XEarR
XEarRC
XEarL
XEarLC
HFSpP
HFSpN
EarP
EarN
p
Microphone module
XMICP
XMICN
ACI
HSEAR R P
HSEAR R N
HSEAR P
HSEAR N
Pop-Port
Pop-Port accessory
IHF speaker and acoustics
Receiver and acoustics
Bluetooth ASIC
PCM
Bluetooth accessory
vibra
VibraP
VibraN

Figure 73 Audio block diagram

Internal microphone

Internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes.

An analogue electret microphone is connected to EM ASIC N2200 ASIC's Mic1P and Mic1N is connected ground near EM ASIC N2200.

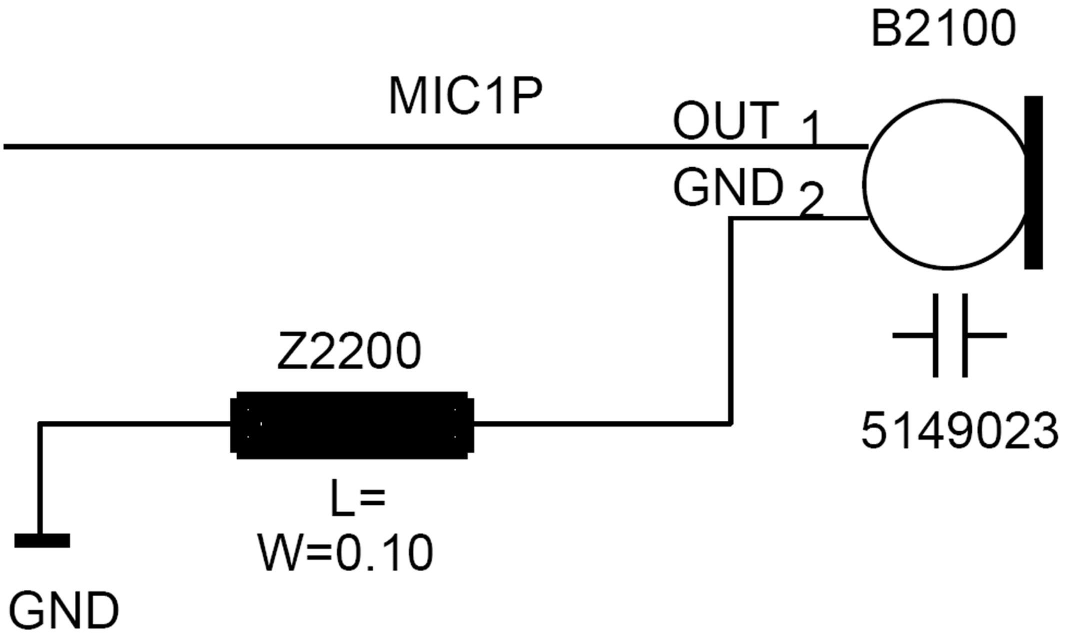

B2100
MIC1P
OUT 1
GND 2
Z2200
5149023
L=
W=0.10
GND

Figure 74 Internal microphone

External microphone

Galvanic accessories are connected to the system connector (Pop-Port^{TM}).

Accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

External microphone circuitry is biased by EM ASIC N2200 ASIC MicB2 bias voltage (inside EM ASIC N2200 ASIP). The circuitry provides a symmetrical connection for the microphone from the Pop-Port^{TM}connections, XMICN and XMICP, to EM ASIC N2200 ASIC inputs, Mic2P and Mic2N.

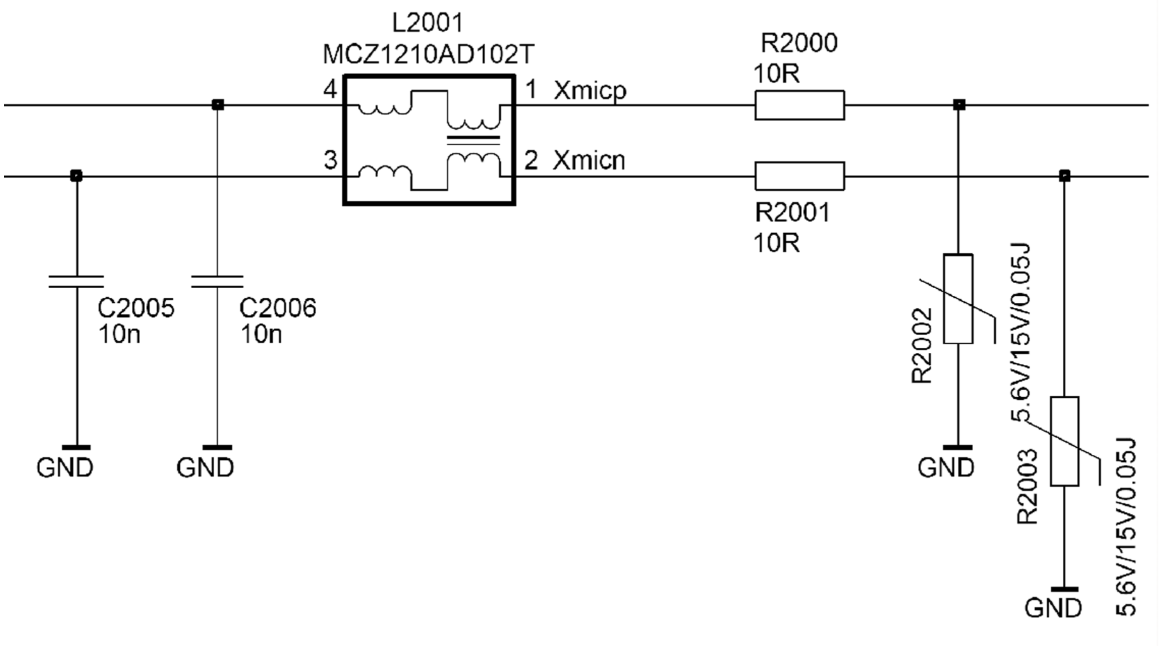

L2001
MCZ1210AD102T
4
3
1 Xmicp
2 Xmicn
R2000
10R
R2001
10R
C2005
10n
C2006
10n
GND
GND
R2002
5.6V/15V/0.05J
GND
R2003
5.6V/15V/0.05J
GND

Figure 75 External microphone

Internal earpiece

The internal earpiece is used in the HandPortable (HP) call mode. A dynamic 7x11 mm earpiece capsule is connected to EM ASIC N2200 ASIC's differential outputs EarP and EarN.

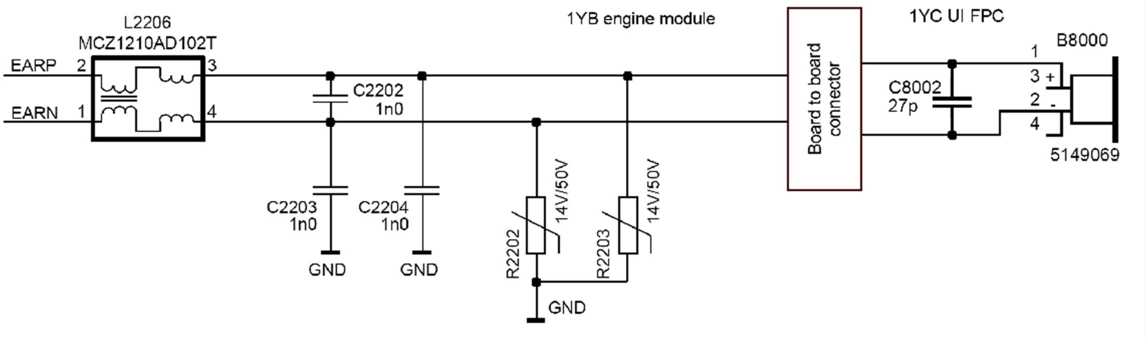

L2206
MCZ1210AD102T
EARP
2
EARN
1
3
4
1YB engine module
C2202
1n0
C2203
1n0
C2204
1n0
GND
GND
R2202
14V/50V
R2203
14V/50V
GND
Board to board connector
1YC UI FPC
C8002
27p
B8000
1
3 +
2 -
4
5149069

Figure 76 Internal earpiece

Internal speaker

The internal speaker is used in Internal HandsFree (IHF) call mode.

A dynamic 20 mm speaker is connected to N2200 ASIC's outputs HFSpP and HFSpN.

The IHF amplifier integrated in EM ASIC N2200 is a Digital Pulse Modulated Amplifier (DPMA).

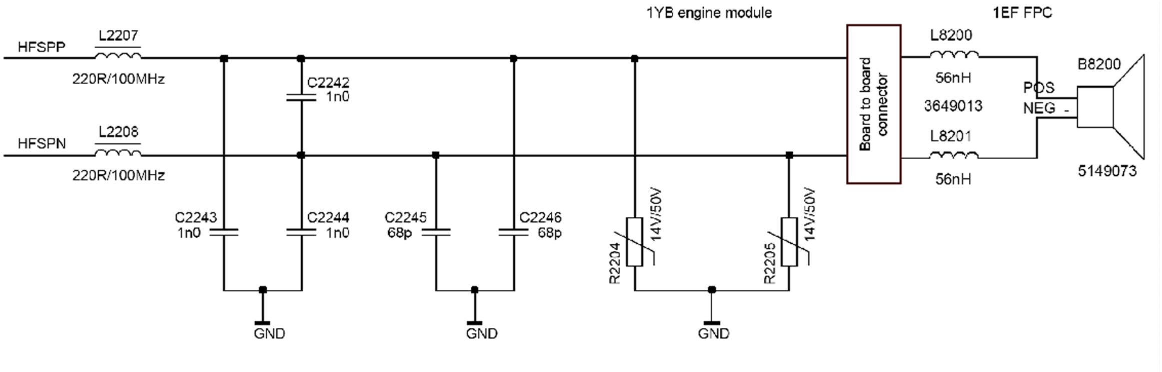

HFSPP
L2207
220R/100MHz
HFSPN
L2208
220R/100MHz
C2242
1n0
C2243
1n0
C2244
1n0
C2245
68p
C2246
68p
R2204
14V/50V
R2205
14V/50V
GND
GND
GND
1YB engine module
Board to board connector
1EF FPC
L8200
56nH
3649013
L8201
56nH
B8200
POS
NEG -
5149073

Figure 77 Internal speaker

External earpiece

All galvanic accessories are connected to the system connector (Pop-Port™).

The accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories.

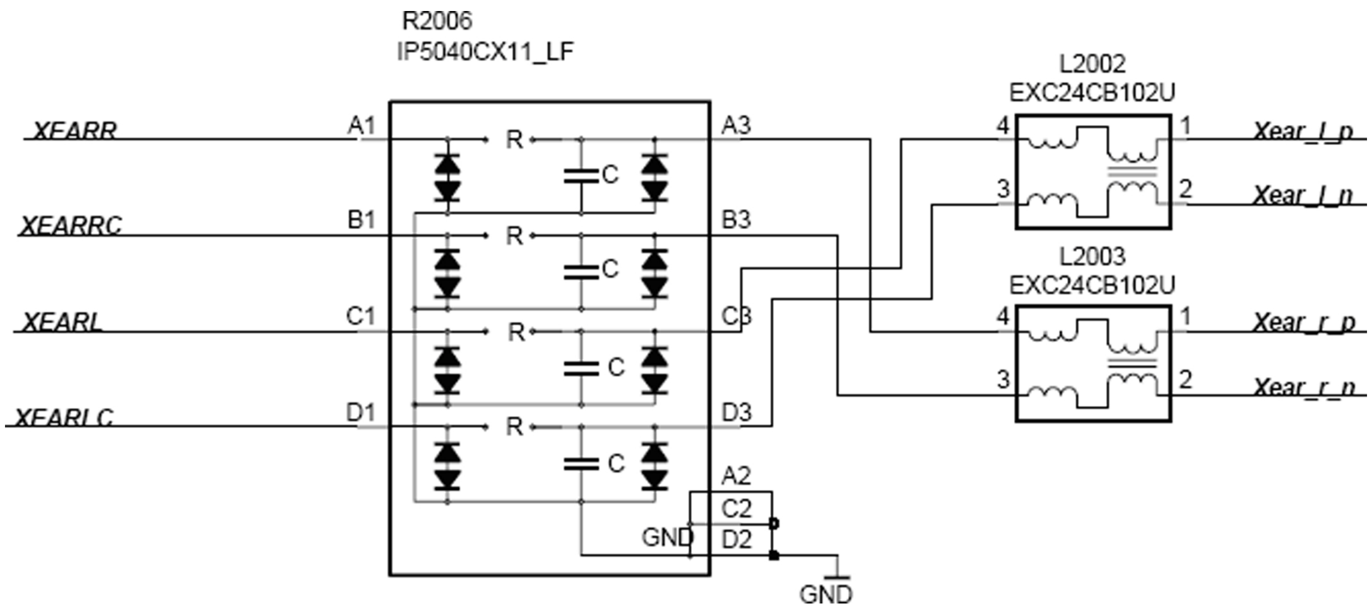

R2006
IP5040CX11_LF
XEARR
XEARRC
XEARL
XEARLC
A1
B1
C1
D1
A3
B3
C3
D3
A2
C2
D2
GND
R
C
L2002
EXC24CB102U
L2003
EXC24CB102U
4
3
1
2
Xear_l_p
Xear_l_n
Xear_r_p
Xear_r_n
GND

Figure 78 External earpiece circuitry (Pop-Port connected on the right)

Vibra circuitry

Vibra is used for vibra-alarm function.

The vibra motor is connected to the N2200 ASIC VibraP and VibraN Pulse Width Modulated (PWM) outputs.

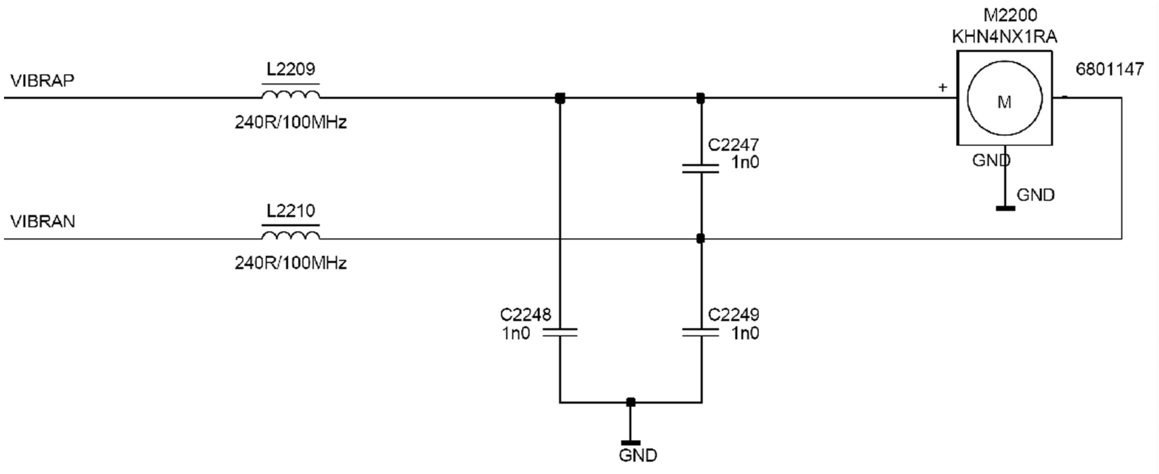

M2200
KHN4NX1RA
6801147
VIBRAP
L2209
240R/100MHz
VIBRAN
L2210
240R/100MHz
C2247
1n0
C2248
1n0
C2249
1n0
M
+
-
GND
GND
GND

Figure 79 Vibra circuitry

Pop-port^{TM} connector

Pop-Port^{TM} connector provides a fully differential 4–wire stereo line-level output connection and fully differential 2-wire mono line-level or microphone level input connection.

The handsfree driver in Vilma is meant for the headset.

The output is driven in a fully differential mode. In the fully differential mode, the handsfree pin is the negative output and the HFCM pin is the positive output. The gain of the handsfree driver in the differential mode is 6 dB.

The earpiece and headset signals are multiplexed so that the outputs cannot be used simultaneously.

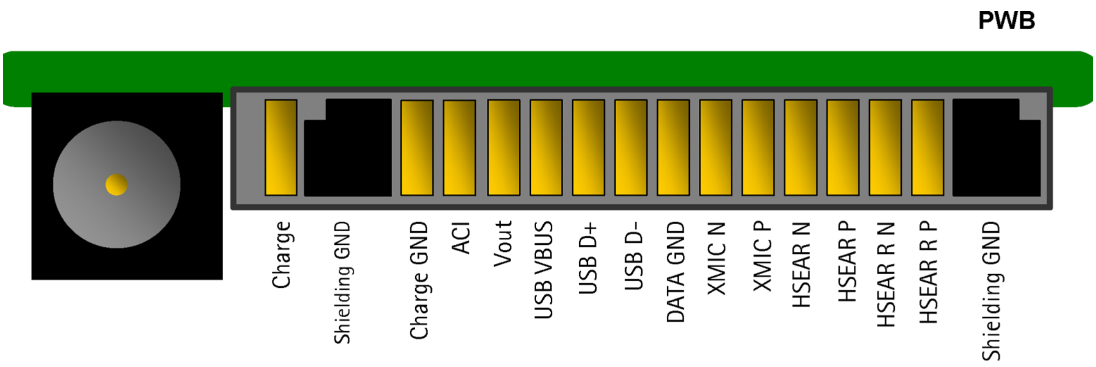

PWB
Charge
Shielding GND
Charge GND
ACI
Vout
USB VBUS
USB D+
USB D-
DATA GND
XMIC N
XMIC P
HSEAR N
HSEAR P
HSEAR R N
HSEAR R P
Shielding GND

Figure 80 External audio connector

Table 21 Audio connector pin assignments

Pin #/ Signal name	Signal description	Spectral range	Voltage/ Current levels	Max or nominal serial impedance	Notes
1/ Charge	V Charge	DC	0-9V/ 0.85A		
2/ GND	Charge GND	-	0.85A	100mΩ (PWB+ conn.)	
3/ ACI	ACI	1kbits/s	Digital 0/ 2.5V-2.78V	47Ω	Insertion & removal detection
4/ Vout	DC out	DC	2.5V 90mA	100mΩ (PWB+ conn.)	200mW
9 / XMIC N	Audio in	300-8k	$1V_{pp}$ &2.5-2.78VDC		
10 / XMIC P	Audio in	300-8k	$1V_{pp}$ &2.5-2.78VDC		
11 / HSEAR N	Audio out	20-20k	$1.25V_{pp}$	10Ω	
12 / HSEAR P	Audio out	20-20k	$1.25V_{pp}$	10Ω	
13 / HSEAR R N	Audio out	20-20k	$1.25V_{pp}$	10Ω	Not conn. in mono
14 / HSEAR R P	Audio out	20-20k	$1.25V_{pp}$	10Ω	Not conn. in mono

Baseband technical specifications

External interfaces

Name of Connection	Connector reference
USB	X2001
Charger	X2000
Headset	X2001
SIM	X8302

Name of Connection	Connector reference
MicroSD	X8301
Battery connector	X2070

VOUT electrical characteristics

Description	Parameter	Min	Max	Typical	Unit	Notes
Vout regulator for external accessories	VOUT	2.43	2.57	2.5	V	Max load 90mA

SIM IF connections

Pin	Signal	I/O	Engine connection		Notes
C1	VSIM	Out	N2200	VSIM1	Supply voltage to SIM card, 1.8 V or 3.0 V.
C2	SIMRST	Out	N2200	SIM1Rst	Reset signal to SIM card
C3	SIMCLK	Out	N2200	SIM1ClkC	Clock signal to SIM card
C5	GND	-	GND		Ground
C7	SIMDATA	In/Out	N2200	SIM1DaC	Data input / output

Charger connector and charging interface connections & electrical characteristics

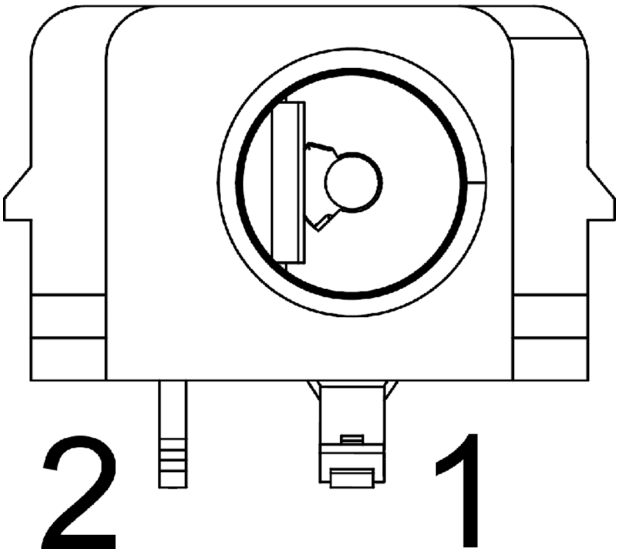


Figure 81 Charger connector

Table 22 Charging interface connections

Pin	Signal	I/O	Engine connection		Notes
1	Vchar	In	N2300	VCharIn1, 2	Charging voltage / charger detection, Center pin
2	Charge GND		Ground		Charger ground

Table 23 Charging IF electrical characteristics

Description	Parameter	Min	Max	Unit	Notes
Vchar	V Charge	0	20	V	Center pin
Vchar	I Charge		0.85	A	Center pin
Charge GND			0.85	A	
Threshold for charging, rising (N2300)	V_{MSTR+}	2.1		V	Typical value
Threshold for charging, falling (N2300)	V_{MSTR-}	1.9		V	Typical value

Battery interface

The battery interface supports a 3-pole battery interface. The interface consists of three connectors: VBAT, BSI and GND.

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

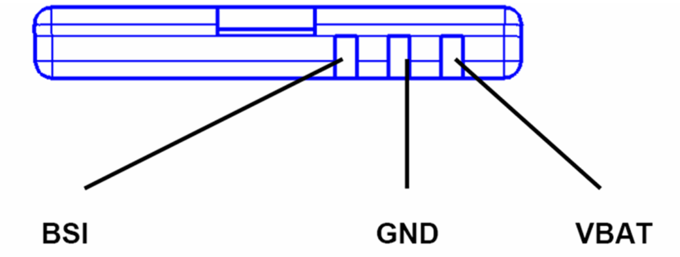


Figure 82 Battery pin order

Table 24 Battery interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VBAT	->	EM ASIC N2200	VBAT	Battery voltage
2	GND	->	GND	GND	Ground

Pin	Signal	I/O	Engine connection		Notes
3	BSI	->	EM ASIC N2200	BSI	Battery size indication (fixed resistor inside the battery pack)

Battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line, which is located on the transceiver PWB, at a place where the phone temperature is most stable.

For service purposes, the device SW can be forced into local mode by using pull down resistors connected to the BSI line.

Internal interfaces

Name of Connection	Connector reference
Display	X8001 in 1YC FPC
ALS	V8004
Vibra	M2200
Microphone	B2100
Earpiece	B8000 in 1YC FPC
IHF speaker	B8200 in 1YC FPC
Side keys	X1550

Display connector and interface connections

Table 25 Display interface connections

Pin	Signal	I/O	Engine connection		Notes
1	VLED1 -	<-	N2301	VLEDout	N2301 is controlled by EM ASIC N2300
2	VLED2-	<-	N2301	VLEDout	N2301 is controlled by EM ASIC N2300
3	VDDI	<-	EM ASIC N2200	VAUX	Core Voltage
4	GND				
5	WRX	<-	Application processor	Lcdrdx	Read Enable (active low)
6	DO	<-	Application processor	Lcdrmd	Data/ Command select
					(high = data
					low = command)

Pin	Signal	I/O	Engine connection		Notes
7	GND	<->	Application processor	Lcdda1	Data
8	D2	<->	Application processor	Lcdda3	Data
9	D4				
10	D6	<->	Application processor	Lcdda5	Data
11	CSX	<->	Application processor	Lcdda7	Data
12	RESX	->	Application processor	Te	Tearing Effect
13	TE	<-	Application processor	Gpio60	Reset (active low)
14	D7	<-	Application processor	Lcdsx	Chip Select (active low)
15	D5	<->	Application processor	Lcdda6	Data
16	GND	<->	Application processor	Lcdda4	Data
17	D3	<->	Application processor	Lcdda2	Data
18	D1				
19	D/CX	<->	Application processor	Lcdda0	Data
20	RDX	->	Application processor	Lcdwrx	Write Enable (active low)
21	GND				
22	VDD	<-	EM ASIC N2200	VIO	Interface voltage
23	VLED2+	->	R2303	SETCURR1	Resistor
24	VLED1+	->	R2303	SETCURR1	Resistor

Back-up battery interface electrical characteristics

Table 26 Back-up battery connections

Pin name	I/O	Connection	Notes
VBack	->	N2200, VBack	Back-up battery G2200 is connected to N2200.

Table 27 Back-up battery electrical characteristics

Description	Parameter	Min	Typ	Max	Unit
Back-Up Battery Voltage	Vback	0	2.5	2.7	V

RF description

Introduction to receiver functionality

Receiver functions are implemented in RF ASIC N7500.

The receiver is a linear direct conversion receiver containing LNA, band pass filter and demodulator for each supported system and band. A second band filter is used between the LNA and demodulator in WCDMA.

After the demodulators the signal paths are combined to one common BB path.

WCDMA receiver

In WCDMA mode the received signal is fed from the antenna to the BAW duplex filter. After the duplex filter the signal goes via balun to the integrated LNA in N7500. After the LNA the signal goes trough band pass filter.

After filtering the signal goes to the down conversion mixer, which converts the signal into baseband I and Q signals (90 degrees phase shift). After the demodulator output there is a RC low pass filter with f0 of ca. 1.5 MHz.

The Rx channel filter must be calibrated with an automatic routine whenever N7500 IC is changed to a phone.

In WCDMA mode the corner frequency of the filter is set to ca. 2.1MHz. The filter is followed by an AGC amplifier with adjustable gain. Signal is further amplified before it is fed to balanced analog IQ output pins. Analog output pins are accompanied by reference voltage output, which sets the DC level for the AD converter in BB ASIC.

GSM receiver

As GSM850, GSM900, GSM1800 and GSM1900 RX branches are functionally identical, the following description is applicable to all of them.

The received signal goes from the GSM antenna to the antenna switch module. The switch module contains PIN diode switches for band and RX/TX. The antenna switch module is followed by integrated LNA stages in the RF ASIC. The LNAs are followed by demodulators which downconvert the signal to baseband I and Q signals.

In the BB-chain there are two adjustable gain stages and one mode specific gain. The first one called BB-gain is just after the demodulator. It has a 12 dB gain range with 6dB steps. After the BB-gain there is the channel select filter.

Main AGC amplifier proceeds the channel selection filter. It has 30 dB of gain control range with 3 dB steps. Final amplifier stage is used as an output buffer for IQ signals. This stage is set to 0 dB gain in GSM mode.

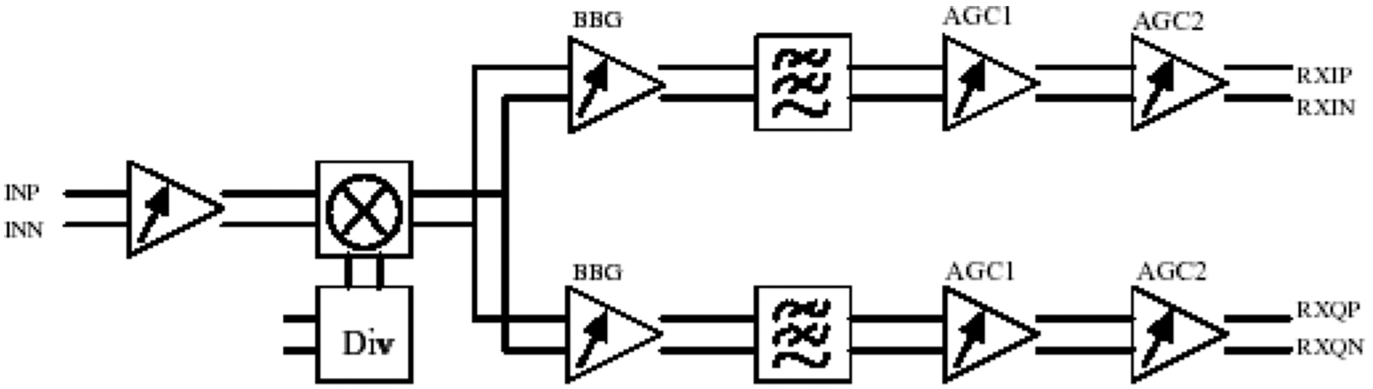


Figure 83 GSM receiver after the antenna switch

Introduction to transmitter functionality

Transmitter functions are implemented in the ASIC N7500. It contains a BB frequency low pass filter, which is tunable according to the signal bandwidth of the system in use. In addition N7500 contain three separate RF paths (GSM850/900, GSM1800/1900 and WCDMA1900/2100) comprising of a final frequency IQ modulator and VGA amplifiers.

WCDMA transmitter

In the transmitter side, an analogue I/Q modulated signal is received from the digital baseband into N7500 and fed through the low pass filter. The corner frequency of the filter is set to approximately 3 MHz.

After the filter the signal is fed to the IQ modulator, which converts the signal to final Tx frequency. There are two separate I/Q modulators:.one for WCDMA and another for GSM850/EGSM900 and DCS1800/PCS1900 signals.

The WCDMA branch is selected by biasing the appropriate modulator. The modulator is followed by two VGA stages giving (85 dB) of gain control range. The signal then exits N7500 via a balanced line.

After the PA the transmitted WCDMA signal is fed through a duplex filter to the antenna.

WCDMA power control

WCDMA TX power control is done by the two VGA stages in N7500 ASIC. The VGA have a common temperature compensation circuit and one voltage mode analog input for gain control (TXC).

The gain of the VGA amplifier chain is controlled by a DA converter in BB. The same DA converter is shared by GSM Tx power control function.

WCDMA PA module

The WCDMA PA is housed in a separate module having:

- a variable supply voltage input for the amplifier stages (Vcc11),
- a battery supply voltage for the bias circuits (Vcc12),
- one bias current inputs.

Bias currents are generated by 5-bit DA (DAC201) converter in N7500 RF ASIC. The converter is controlled via RFBus.

PA DCDC converter

A 5 bit DA (DAC101) converter in N7500 RF ASIC controls the DC-DC converter. The converter is controlled via RFBus. The DCDC converter limits the lowest supply voltage to 1.3 V. At highest power levels the DCDC converter output settles nominally to 3.1 V.

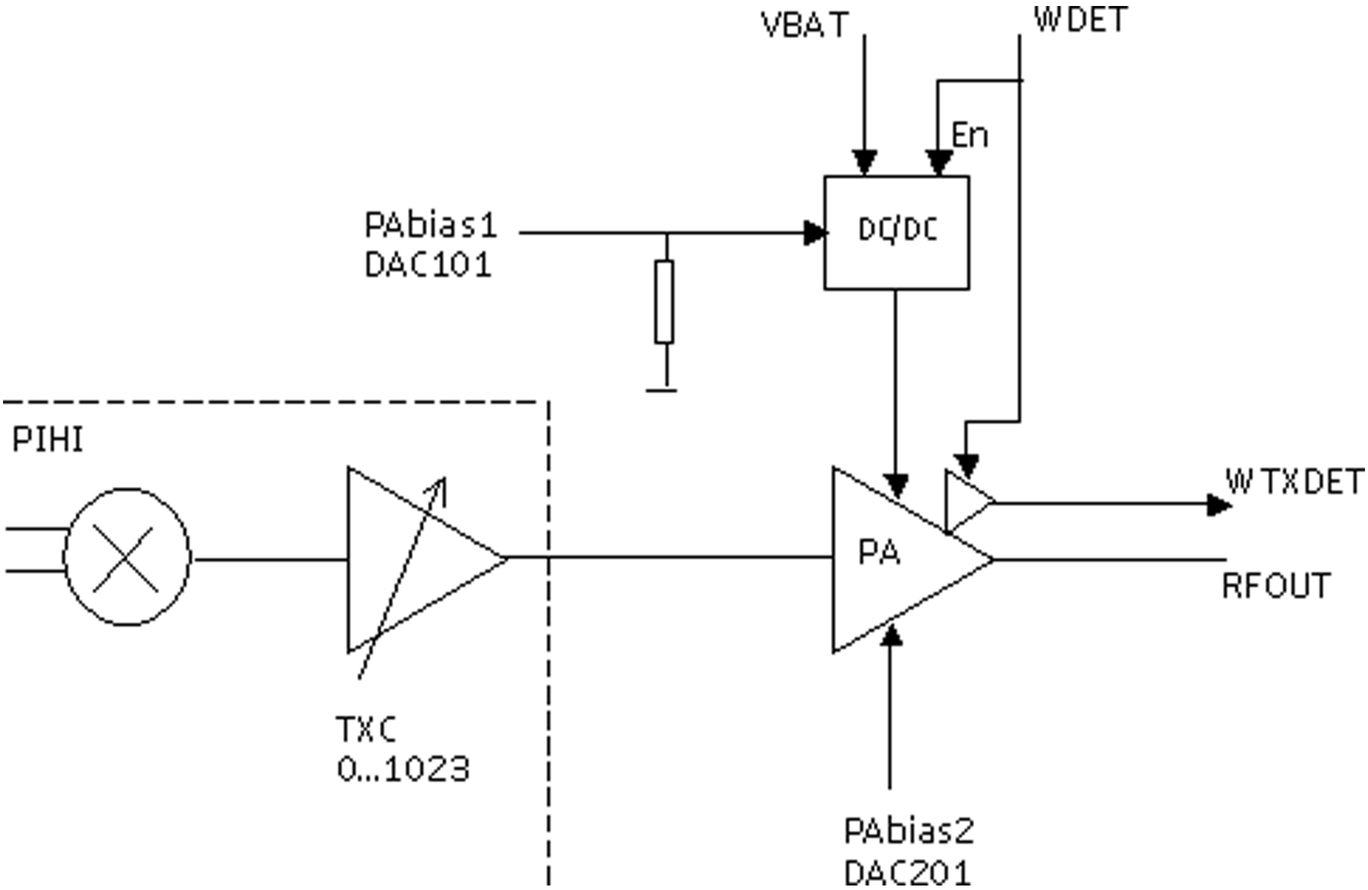


Figure 84 Block diagram of DCDC converter and WCDMA PA

GSM transmitter

An analog IQ modulated signal is fed to N7500 from Digital BB in current form. It is first low pass filtered with filter corner frequency set to ca. 200 kHz. After the filter the signal is routed to the GSM modulator. The appropriate routing after the modulator is selected by biasing either GSM850/EGSM900 or DCS1800/PCS1900 variable gain amplifier. The amplifier gives 55 dB of power control dynamic range.

After the VGA stage the signal exits N7500. In case of DCS1800/PCS1900 the signal goes directly to the GSM PA module. In case of GSM850/EGSM900 the PA module is preceded by a switch able SAW filter. After the filter, the signal is fed to GSM TX front-end module (TXFEM), which also contains antenna switch.

GSM power control

A closed control loop comprising of an integrated power detector (in PA module) and an error amplifier, which is integrated in N7500, controls GSM transmitter power. Detector output from the PA gives a DC level proportional to the output power.

Note: Timings are not shown accurately in the previous figure.

GSM PA module

TXFEM module contains two separate amplifier chains, one for GSM850/EGSM900 and another for DCS1800/PCS1900. Both amplifiers have a battery supply connection and two bias current inputs.

Frequency synthesizers

RF have separate synthesizers for WCDMA RX and WCDMA TX / one for GSM TX / RX.

Reference oscillators

As a reference oscillator for the frequency synthesizers a 38.4MHz VCTCXO (voltage controlled temperature compensated crystal oscillator) is used.

Regulators

RF is combined with mixed mode ASIC Betty that contains the DA converters for power control and AFC functions, a slow AD converter for WCDMA power detection and other measurements. It also contains a regulator for VCTXCO and it's peripherals.

N7500 contain integrated regulators to supply regulated voltages for their internal circuitry and other RF parts.

Antenna connections

Device includes two different PIFA type antennas. WCDMA antenna has one feed and one ground contact. GSM antenna is like normal dual band PIFA antenna (one feed and one ground point) but then there is also extra ground point, which is connected certain point of the PIFA element. That point has been grounded via PHEMT switch to certain load so that antenna resonance will spread. This way it is possible to have two different dual band antennas (900/1800 or 850/1900). All contacts are made with C-clips springs. BT/WLAN antenna consists of a ceramic resonator.

Frequency mappings

GSM850 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
128	824.2	869.2	3296.8	3476.8	170	832.6	877.6	3330.4	3510.4	212	841.0	886.0	3364.0	3544.0
129	824.4	869.4	3297.6	3477.6	171	832.8	877.8	3331.2	3511.2	213	841.2	886.2	3364.8	3544.8
130	824.6	869.6	3298.4	3478.4	172	833.0	878.0	3332.0	3512.0	214	841.4	886.4	3365.6	3545.6
131	824.8	869.8	3299.2	3479.2	173	833.2	878.2	3332.8	3512.8	215	841.6	886.6	3366.4	3546.4
132	825.0	870.0	3300.0	3480.0	174	833.4	878.4	3333.6	3513.6	216	841.8	886.8	3367.2	3547.2
133	825.2	870.2	3300.8	3480.8	175	833.6	878.6	3334.4	3514.4	217	842.0	887.0	3368.0	3548.0
134	825.4	870.4	3301.6	3481.6	176	833.8	878.8	3335.2	3515.2	218	842.2	887.2	3368.8	3548.8
135	825.6	870.6	3302.4	3482.4	177	834.0	879.0	3336.0	3516.0	219	842.4	887.4	3369.6	3549.6
136	825.8	870.8	3303.2	3483.2	178	834.2	879.2	3336.8	3516.8	220	842.6	887.6	3370.4	3550.4
137	826.0	871.0	3304.0	3484.0	179	834.4	879.4	3337.6	3517.6	221	842.8	887.8	3371.2	3551.2
138	826.2	871.2	3304.8	3484.8	180	834.6	879.6	3338.4	3518.4	222	843.0	888.0	3372.0	3552.0
139	826.4	871.4	3305.6	3485.6	181	834.8	879.8	3339.2	3519.2	223	843.2	888.2	3372.8	3552.8
140	826.6	871.6	3306.4	3486.4	182	835.0	880.0	3340.0	3520.0	224	843.4	888.4	3373.6	3553.6
141	826.8	871.8	3307.2	3487.2	183	835.2	880.2	3340.8	3520.8	225	843.6	888.6	3374.4	3554.4
142	827.0	872.0	3308.0	3488.0	184	835.4	880.4	3341.6	3521.6	226	843.8	888.8	3375.2	3555.2
143	827.2	872.2	3308.8	3488.8	185	835.6	880.6	3342.4	3522.4	227	844.0	889.0	3376.0	3556.0
144	827.4	872.4	3309.6	3489.6	186	835.8	880.8	3343.2	3523.2	228	844.2	889.2	3376.8	3556.8
145	827.6	872.6	3310.4	3490.4	187	836.0	881.0	3344.0	3524.0	229	844.4	889.4	3377.6	3557.6
146	827.8	872.8	3311.2	3491.2	188	836.2	881.2	3344.8	3524.8	230	844.6	889.6	3378.4	3558.4
147	828.0	873.0	3312.0	3492.0	189	836.4	881.4	3345.6	3525.6	231	844.8	889.8	3379.2	3559.2
148	828.2	873.2	3312.8	3492.8	190	836.6	881.6	3346.4	3526.4	232	845.0	890.0	3380.0	3560.0
149	828.4	873.4	3313.6	3493.6	191	836.8	881.8	3347.2	3527.2	233	845.2	890.2	3380.8	3560.8
150	828.6	873.6	3314.4	3494.4	192	837.0	882.0	3348.0	3528.0	234	845.4	890.4	3381.6	3561.6
151	828.8	873.8	3315.2	3495.2	193	837.2	882.2	3348.8	3528.8	235	845.6	890.6	3382.4	3562.4
152	829.0	874.0	3316.0	3496.0	194	837.4	882.4	3349.6	3529.6	236	845.8	890.8	3383.2	3563.2
153	829.2	874.2	3316.8	3496.8	195	837.6	882.6	3350.4	3530.4	237	846.0	891.0	3384.0	3564.0
154	829.4	874.4	3317.6	3497.6	196	837.8	882.8	3351.2	3531.2	238	846.2	891.2	3384.8	3564.8
155	829.6	874.6	3318.4	3498.4	197	838.0	883.0	3352.0	3532.0	239	846.4	891.4	3385.6	3565.6
156	829.8	874.8	3319.2	3499.2	198	838.2	883.2	3352.8	3532.8	240	846.6	891.6	3386.4	3566.4
157	830.0	875.0	3320.0	3500.0	199	838.4	883.4	3353.6	3533.6	241	846.8	891.8	3387.2	3567.2
158	830.2	875.2	3320.8	3500.8	200	838.6	883.6	3354.4	3534.4	242	847.0	892.0	3388.0	3568.0
159	830.4	875.4	3321.6	3501.6	201	838.8	883.8	3355.2	3535.2	243	847.2	892.2	3388.8	3568.8
160	830.6	875.6	3322.4	3502.4	202	839.0	884.0	3356.0	3536.0	244	847.4	892.4	3389.6	3569.6
161	830.8	875.8	3323.2	3503.2	203	839.2	884.2	3356.8	3536.8	245	847.6	892.6	3390.4	3570.4
162	831.0	876.0	3324.0	3504.0	204	839.4	884.4	3357.6	3537.6	246	847.8	892.8	3391.2	3571.2
163	831.2	876.2	3324.8	3504.8	205	839.6	884.6	3358.4	3538.4	247	848.0	893.0	3392.0	3572.0
164	831.4	876.4	3325.6	3505.6	206	839.8	884.8	3359.2	3539.2	248	848.2	893.2	3392.8	3572.8
165	831.6	876.6	3326.4	3506.4	207	840.0	885.0	3360.0	3540.0	249	848.4	893.4	3393.6	3573.6
166	831.8	876.8	3327.2	3507.2	208	840.2	885.2	3360.8	3540.8	250	848.6	893.6	3394.4	3574.4
167	832.0	877.0	3328.0	3508.0	209	840.4	885.4	3361.6	3541.6	251	848.8	893.8	3395.2	3575.2

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

WCDMA 2100 Rx frequencies

Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX
10562	2112.4	4224.8	10625	2125	4250	10688	2137.6	4275.2	10751	2150.2	4300.4	10814	2162.8	4325.6
10563	2112.6	4225.2	10626	2125.2	4250.4	10689	2137.8	4275.6	10752	2150.4	4300.8	10815	2163	4326
10564	2112.8	4225.6	10627	2125.4	4250.8	10690	2138	4276	10753	2150.6	4301.2	10816	2163.2	4326.4
10565	2113	4226	10628	2125.6	4251.2	10691	2138.2	4276.4	10754	2150.8	4301.6	10817	2163.4	4326.8
10566	2113.2	4226.4	10629	2125.8	4251.6	10692	2138.4	4276.8	10755	2151	4302	10818	2163.6	4327.2
10567	2113.4	4226.8	10630	2126	4252	10693	2138.6	4277.2	10756	2151.2	4302.4	10819	2163.8	4327.6
10568	2113.6	4227.2	10631	2126.2	4252.4	10694	2138.8	4277.6	10757	2151.4	4302.8	10820	2164	4328
10569	2113.8	4227.6	10632	2126.4	4252.8	10695	2139	4278	10758	2151.6	4303.2	10821	2164.2	4328.4
10570	2114	4228	10633	2126.6	4253.2	10696	2139.2	4278.4	10759	2151.8	4303.6	10822	2164.4	4328.8
10571	2114.2	4228.4	10634	2126.8	4253.6	10697	2139.4	4278.8	10760	2152	4304	10823	2164.6	4329.2
10572	2114.4	4228.8	10635	2127	4254	10698	2139.6	4279.2	10761	2152.2	4304.4	10824	2164.8	4329.6
10573	2114.6	4229.2	10636	2127.2	4254.4	10699	2139.8	4279.6	10762	2152.4	4304.8	10825	2165	4330
10574	2114.8	4229.6	10637	2127.4	4254.8	10700	2140	4280	10763	2152.6	4305.2	10826	2165.2	4330.4
10575	2115	4230	10638	2127.6	4255.2	10701	2140.2	4280.4	10764	2152.8	4305.6	10827	2165.4	4330.8
10576	2115.2	4230.4	10639	2127.8	4255.6	10702	2140.4	4280.8	10765	2153	4306	10828	2165.6	4331.2
10577	2115.4	4230.8	10640	2128	4256	10703	2140.6	4281.2	10766	2153.2	4306.4	10829	2165.8	4331.6
10578	2115.6	4231.2	10641	2128.2	4256.4	10704	2140.8	4281.6	10767	2153.4	4306.8	10830	2166	4332
10579	2115.8	4231.6	10642	2128.4	4256.8	10705	2141	4282	10768	2153.6	4307.2	10831	2166.2	4332.4
10580	2116	4232	10643	2128.6	4257.2	10706	2141.2	4282.4	10769	2153.8	4307.6	10832	2166.4	4332.8
10581	2116.2	4232.4	10644	2128.8	4257.6	10707	2141.4	4282.8	10770	2154	4308	10833	2166.6	4333.2
10582	2116.4	4232.8	10645	2129	4258	10708	2141.6	4283.2	10771	2154.2	4308.4	10834	2166.8	4333.6
10583	2116.6	4233.2	10646	2129.2	4258.4	10709	2141.8	4283.6	10772	2154.4	4308.8	10835	2167	4334
10584	2116.8	4233.6	10647	2129.4	4258.8	10710	2142	4284	10773	2154.6	4309.2	10836	2167.2	4334.4
10585	2117	4234	10648	2129.6	4259.2	10711	2142.2	4284.4	10774	2154.8	4309.6	10837	2167.4	4334.8
10586	2117.2	4234.4	10649	2129.8	4259.6	10712	2142.4	4284.8	10775	2155	4310	10838	2167.6	4335.2
10587	2117.4	4234.8	10650	2130	4260	10713	2142.6	4285.2	10776	2155.2	4310.4			
10588	2117.6	4235.2	10651	2130.2	4260.4	10714	2142.8	4285.6	10777	2155.4	4310.8			
10589	2117.8	4235.6	10652	2130.4	4260.8	10715	2143	4286	10778	2155.6	4311.2			
10590	2118	4236	10653	2130.6	4261.2	10716	2143.2	4286.4	10779	2155.8	4311.6			
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10592	2118.4	4236.8	10655	2131	4262	10718	2143.6	4287.2	10781	2156.2	4312.4			
10593	2118.6	4237.2	10656	2131.2	4262.4	10719	2143.8	4287.6	10782	2156.4	4312.8			
10594	2118.8	4237.6	10657	2131.4	4262.8	10720	2144	4288	10783	2156.6	4313.2			
10595	2119	4238	10658	2131.6	4263.2	10721	2144.2	4288.4	10784	2156.8	4313.6			
10596	2119.2	4238.4	10659	2131.8	4263.6	10722	2144.4	4288.8	10785	2157	4314			
10597	2119.4	4238.8	10660	2132	4264	10723	2144.6	4289.2	10786	2157.2	4314.4			
10598	2119.6	4239.2	10661	2132.2	4264.4	10724	2144.8	4289.6	10787	2157.4	4314.8			
10599	2119.8	4239.6	10662	2132.4	4264.8	10725	2145	4290	10788	2157.6	4315.2			
10600	2120	4240	10663	2132.6	4265.2	10726	2145.2	4290.4	10789	2157.8	4315.6			
10601	2120.2	4240.4	10664	2132.8	4265.6	10727	2145.4	4290.8	10790	2158	4316			
10602	2120.4	4240.8	10665	2133	4266	10728	2145.6	4291.2	10791	2158.2	4316.4			
10603	2120.6	4241.2	10666	2133.2	4266.4	10729	2145.8	4291.6	10792	2158.4	4316.8			
10604	2120.8	4241.6	10667	2133.4	4266.8	10730	2146	4292	10793	2158.6	4317.2			
10605	2121	4242	10668	2133.6	4267.2	10731	2146.2	4292.4	10794	2158.8	4317.6			
10606	2121.2	4242.4	10669	2133.8	4267.6	10732	2146.4	4292.8	10795	2159	4318			
10607	2121.4	4242.8	10670	2134	4268	10733	2146.6	4293.2	10796	2159.2	4318.4			
10608	2121.6	4243.2	10671	2134.2	4268.4	10734	2146.8	4293.6	10797	2159.4	4318.8			
10609	2121.8	4243.6	10672	2134.4	4268.8	10735	2147	4294	10798	2159.6	4319.2			
10610	2122	4244	10673	2134.6	4269.2	10736	2147.2	4294.4	10799	2159.8	4319.6			
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10612	2122.4	4244.8	10675	2135	4270	10738	2147.6	4295.2	10801	2160.2	4320.4			
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10615	2123	4246	10678	2135.6	4271.2	10741	2148.2	4296.4	10804	2160.8	4321.6			
10616	2123.2	4246.4	10679	2135.8	4271.6	10742	2148.4	4296.8	10805	2161	4322			
10617	2123.4	4246.8	10680	2136	4272	10743	2148.6	4297.2	10806	2161.2	4322.4			
10618	2123.6	4247.2	10681	2136.2	4272.4	10744	2148.8	4297.6	10807	2161.4	4322.8			
10619	2123.8	4247.6	10682	2136.4	4272.8	10745	2149	4298	10808	2161.6	4323.2			
10620	2124	4248	10683	2136.6	4273.2	10746	2149.2	4298.4	10809	2161.8	4323.6			
10621	2124.2	4248.4	10684	2136.8	4273.6	10747	2149.4	4298.8	10810	2162	4324			
10622	2124.4	4248.8	10685	2137	4274	10748	2149.6	4299.2	10811	2162.2	4324.4			
10623	2124.6	4249.2	10686	2137.2	4274.4	10749	2149.8	4299.6	10812	2162.4	4324.8			
10624	2124.8	4249.6	10687	2137.4	4274.8	10750	2150	4300	10813	2162.6	4325.2			

WCDMA 2100 Tx frequencies

Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx
9612	1922.4	3844.8	9671	1934.2	3868.4	9730	1946	3892	9789	1957.8	3915.6	9848	1969.6	3939.2
9613	1922.6	3845.2	9672	1934.4	3868.8	9731	1946.2	3892.4	9790	1958	3916	9849	1969.8	3939.6
9614	1922.8	3845.6	9673	1934.6	3869.2	9732	1946.4	3892.8	9791	1958.2	3916.4	9850	1970	3940
9615	1923	3846	9674	1934.8	3869.6	9733	1946.6	3893.2	9792	1958.4	3916.8	9851	1970.2	3940.4
9616	1923.2	3846.4	9675	1935	3870	9734	1946.8	3893.6	9793	1958.6	3917.2	9852	1970.4	3940.8
9617	1923.4	3846.8	9676	1935.2	3870.4	9735	1947	3894	9794	1958.8	3917.6	9853	1970.6	3941.2
9618	1923.6	3847.2	9677	1935.4	3870.8	9736	1947.2	3894.4	9795	1959	3918	9854	1970.8	3941.6
9619	1923.8	3847.6	9678	1935.6	3871.2	9737	1947.4	3894.8	9796	1959.2	3918.4	9855	1971	3942
9620	1924	3848	9679	1935.8	3871.6	9738	1947.6	3895.2	9797	1959.4	3918.8	9856	1971.2	3942.4
9621	1924.2	3848.4	9680	1936	3872	9739	1947.8	3895.6	9798	1959.6	3919.2	9857	1971.4	3942.8
9622	1924.4	3848.8	9681	1936.2	3872.4	9740	1948	3896	9799	1959.8	3919.6	9858	1971.6	3943.2
9623	1924.6	3849.2	9682	1936.4	3872.8	9741	1948.2	3896.4	9800	1960	3920	9859	1971.8	3943.6
9624	1924.8	3849.6	9683	1936.6	3873.2	9742	1948.4	3896.8	9801	1960.2	3920.4	9860	1972	3944
9625	1925	3850	9684	1936.8	3873.6	9743	1948.6	3897.2	9802	1960.4	3920.8	9861	1972.2	3944.4
9626	1925.2	3850.4	9685	1937	3874	9744	1948.8	3897.6	9803	1960.6	3921.2	9862	1972.4	3944.8
9627	1925.4	3850.8	9686	1937.2	3874.4	9745	1949	3898	9804	1960.8	3921.6	9863	1972.6	3945.2
9628	1925.6	3851.2	9687	1937.4	3874.8	9746	1949.2	3898.4	9805	1961	3922	9864	1972.8	3945.6
9629	1925.8	3851.6	9688	1937.6	3875.2	9747	1949.4	3898.8	9806	1961.2	3922.4	9865	1973	3946
9630	1926	3852	9689	1937.8	3875.6	9748	1949.6	3899.2	9807	1961.4	3922.8	9866	1973.2	3946.4
9631	1926.2	3852.4	9690	1938	3876	9749	1949.8	3899.6	9808	1961.6	3923.2	9867	1973.4	3946.8
9632	1926.4	3852.8	9691	1938.2	3876.4	9750	1950	3900	9809	1961.8	3923.6	9868	1973.6	3947.2
9633	1926.6	3853.2	9692	1938.4	3876.8	9751	1950.2	3900.4	9810	1962	3924	9869	1973.8	3947.6
9634	1926.8	3853.6	9693	1938.6	3877.2	9752	1950.4	3900.8	9811	1962.2	3924.4	9870	1974	3948
9635	1927	3854	9694	1938.8	3877.6	9753	1950.6	3901.2	9812	1962.4	3924.8	9871	1974.2	3948.4
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9637	1927.4	3854.8	9696	1939.2	3878.4	9755	1951	3902	9814	1962.8	3925.6	9873	1974.6	3949.2
9638	1927.6	3855.2	9697	1939.4	3878.8	9756	1951.2	3902.4	9815	1963	3926	9874	1974.8	3949.6
9639	1927.8	3855.6	9698	1939.6	3879.2	9757	1951.4	3902.8	9816	1963.2	3926.4	9875	1975	3950
9640	1928	3856	9699	1939.8	3879.6	9758	1951.6	3903.2	9817	1963.4	3926.8	9876	1975.2	3950.4
9641	1928.2	3856.4	9700	1940	3880	9759	1951.8	3903.6	9818	1963.6	3927.2	9877	1975.4	3950.8
9642	1928.4	3856.8	9701	1940.2	3880.4	9760	1952	3904	9819	1963.8	3927.6	9878	1975.6	3951.2
9643	1928.6	3857.2	9702	1940.4	3880.8	9761	1952.2	3904.4	9820	1964	3928	9879	1975.8	3951.6
9644	1928.8	3857.6	9703	1940.6	3881.2	9762	1952.4	3904.8	9821	1964.2	3928.4	9880	1976	3952
9645	1929	3858	9704	1940.8	3881.6	9763	1952.6	3905.2	9822	1964.4	3928.8	9881	1976.2	3952.4
9646	1929.2	3858.4	9705	1941	3882	9764	1952.8	3905.6	9823	1964.6	3929.2	9882	1976.4	3952.8
9647	1929.4	3858.8	9706	1941.2	3882.4	9765	1953	3906	9824	1964.8	3929.6	9883	1976.6	3953.2
9648	1929.6	3859.2	9707	1941.4	3882.8	9766	1953.2	3906.4	9825	1965	3930	9884	1976.8	3953.6
9649	1929.8	3859.6	9708	1941.6	3883.2	9767	1953.4	3906.8	9826	1965.2	3930.4	9885	1977	3954
9650	1930	3860	9709	1941.8	3883.6	9768	1953.6	3907.2	9827	1965.4	3930.8	9886	1977.2	3954.4
9651	1930.2	3860.4	9710	1942	3884	9769	1953.8	3907.6	9828	1965.6	3931.2	9887	1977.4	3954.8
9652	1930.4	3860.8	9711	1942.2	3884.4	9770	1954	3908	9829	1965.8	3931.6	9888	1977.6	3955.2
9653	1930.6	3861.2	9712	1942.4	3884.8	9771	1954.2	3908.4	9830	1966	3932			
9654	1930.8	3861.6	9713	1942.6	3885.2	9772	1954.4	3908.8	9831	1966.2	3932.4			
9655	1931	3862	9714	1942.8	3885.6	9773	1954.6	3909.2	9832	1966.4	3932.8			
9656	1931.2	3862.4	9715	1943	3886	9774	1954.8	3909.6	9833	1966.6	3933.2			
9657	1931.4	3862.8	9716	1943.2	3886.4	9775	1955	3910	9834	1966.8	3933.6			
9658	1931.6	3863.2	9717	1943.4	3886.8	9776	1955.2	3910.4	9835	1967	3934			
9659	1931.8	3863.6	9718	1943.6	3887.2	9777	1955.4	3910.8	9836	1967.2	3934.4			
9660	1932	3864	9719	1943.8	3887.6	9778	1955.6	3911.2	9837	1967.4	3934.8			
9661	1932.2	3864.4	9720	1944	3888	9779	1955.8	3911.6	9838	1967.6	3935.2			
9662	1932.4	3864.8	9721	1944.2	3888.4	9780	1956	3912	9839	1967.8	3935.6			
9663	1932.6	3865.2	9722	1944.4	3888.8	9781	1956.2	3912.4	9840	1968	3936			
9664	1932.8	3865.6	9723	1944.6	3889.2	9782	1956.4	3912.8	9841	1968.2	3936.4			
9665	1933	3866	9724	1944.8	3889.6	9783	1956.6	3913.2	9842	1968.4	3936.8			
9666	1933.2	3866.4	9725	1945	3890	9784	1956.8	3913.6	9843	1968.6	3937.2			
9667	1933.4	3866.8	9726	1945.2	3890.4	9785	1957	3914	9844	1968.8	3937.6			
9668	1933.6	3867.2	9727	1945.4	3890.8	9786	1957.2	3914.4	9845	1969	3938			
9669	1933.8	3867.6	9728	1945.6	3891.2	9787	1957.4	3914.8	9846	1969.2	3938.4			
9670	1934	3868	9729	1945.8	3891.6	9788	1957.6	3915.2	9847	1969.4	3938.8			

10 — Schematics

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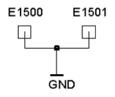
BB and RF shields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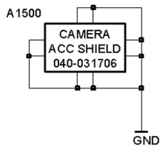
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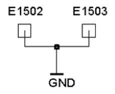
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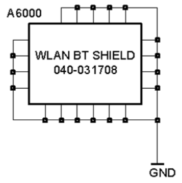
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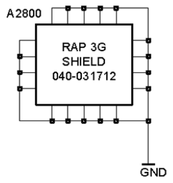
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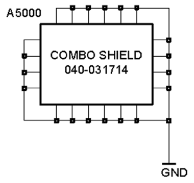
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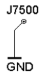
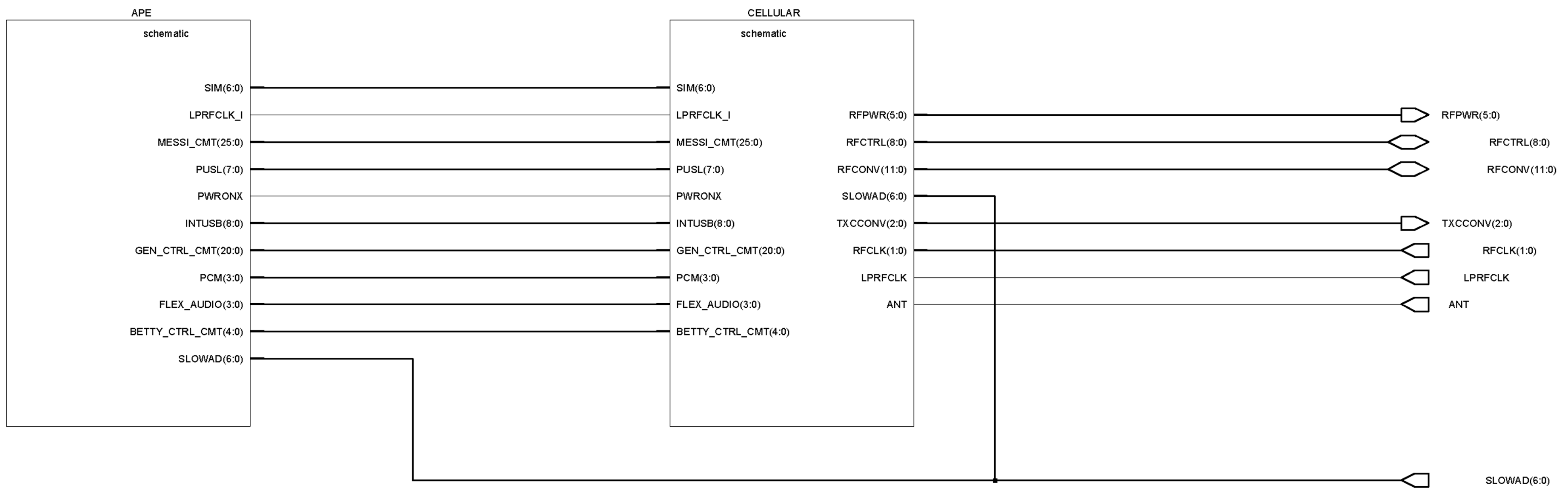


BB top level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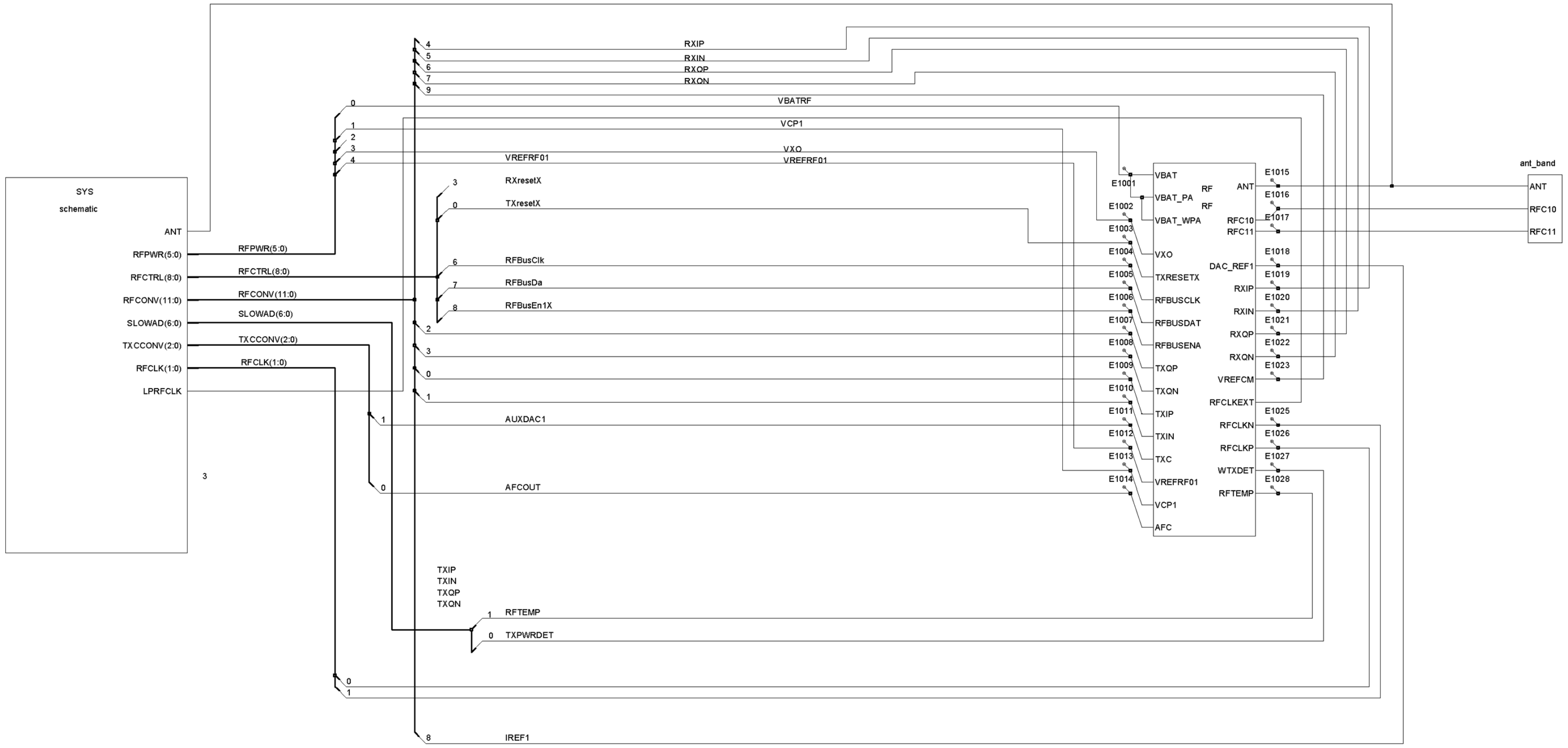
BB and RF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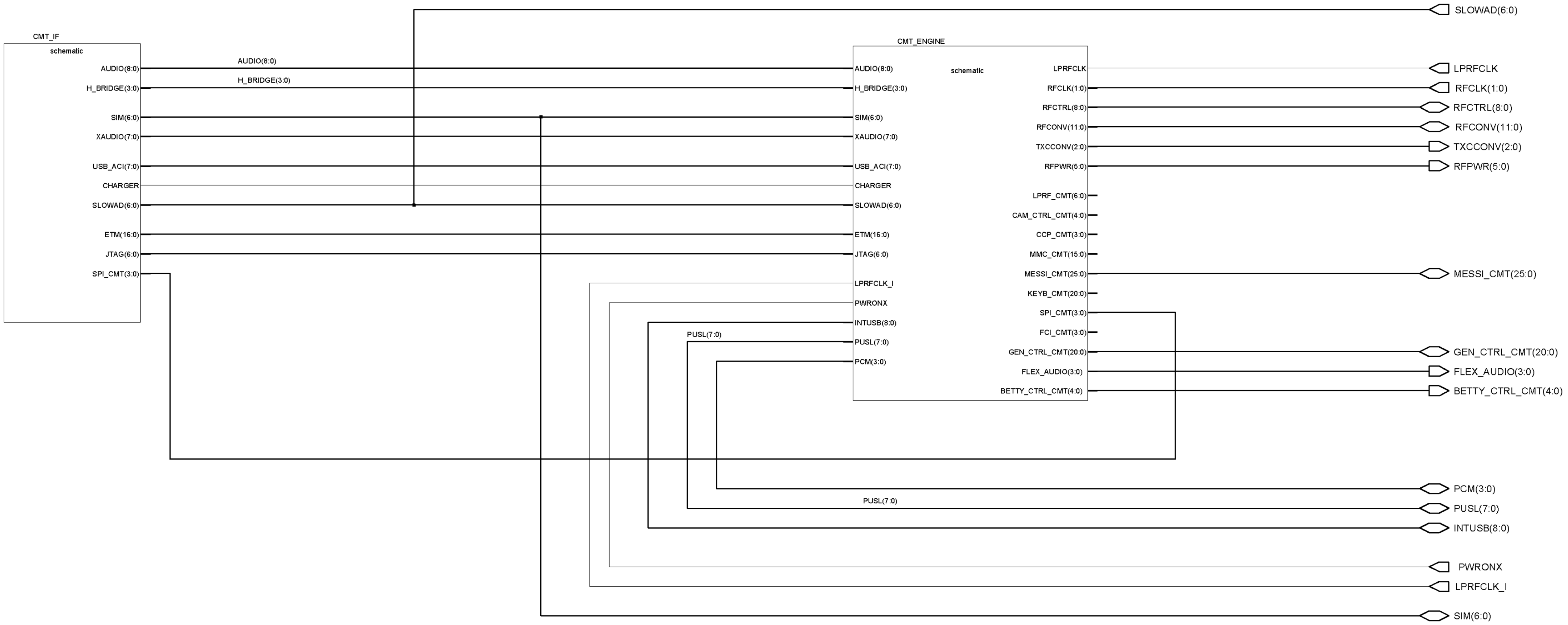
VCP1
AFC
RF
RF
ANT
RFC10
RFC11
DAC_REF1
RXIP
RXIN
RXQP
RXQN
VREFCM
RFCLKEXT
RFCLKN
RFCLKP
WTXDET
RFTEMP
E1015
E1016
E1017
E1018
E1019
E1020
E1021
E1022
E1023
E1025
E1026
E1027
E1028
ant_band
ANT
RFC10
RFC11

CMT SHEET NAME	REF AREA
1yb_hw/cellular/cmt_engine/digi/rap	2800-2899
1yb_hw/cellular/cmt_engine/digi/mem_cmt	3000-3099
1yb_hw/cellular/cmt_engine/power/retu	2200-2299
1yb_hw/cellular/cmt_engine/power/tahvo	2300-2399
1yb_hw/cellular/cmt_if/sys_conn	2000-2059
1yb_hw/cellular/cmt_if/prod_test_pattern	2060-2069
1yb_hw/cellular/cmt_if/battery_conn	2070-2099
1yb_hw/cellular/cmt_if/audio	2100-2199
1yb_hw/cellular/cmt_if/sim	2700-2759

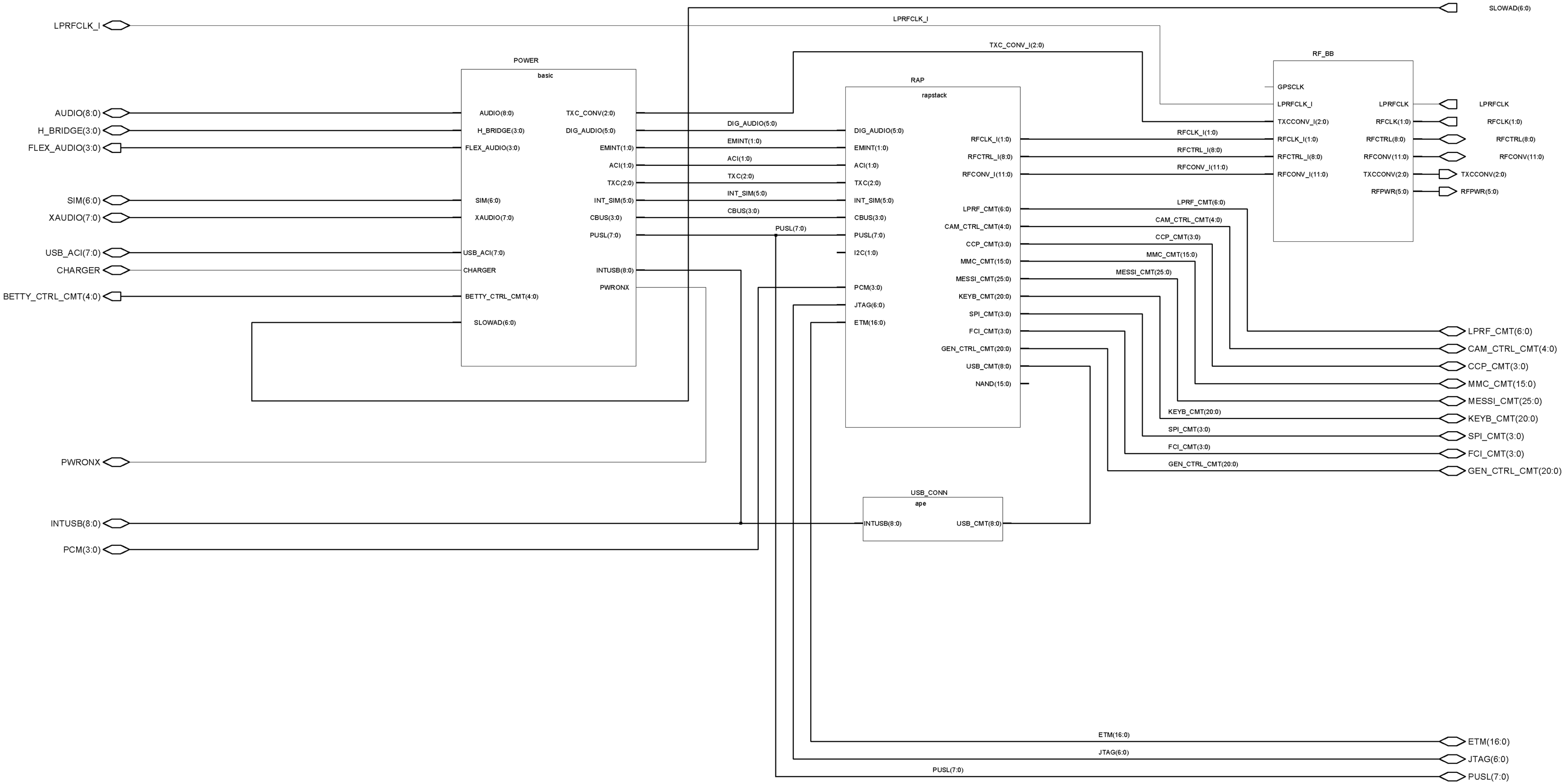
APE SHEET NAME	REF AREA
1yb_hw/ape/ape_engine/mem_ape	5000-5099
1yb_hw/ape/ape_engine/cpu	4800-4899
1yb_hw/ape/ape_engine/pwr_ape	4200-4399
1yb_hw/ape/ape_if/emu_ape	5100-5199
1yb_hw/ape/ape_if/bluetooth	6000-6099
1yb_hw/ape/ape_if/mmc	5200-5299
1yb_hw/ape/ape_if/camera	1500-1599
1yb_hw/ape/ape_if/ui	4400-4599

RF SHEET NAME	REF AREA
1yb_hw/RF	7500-7599

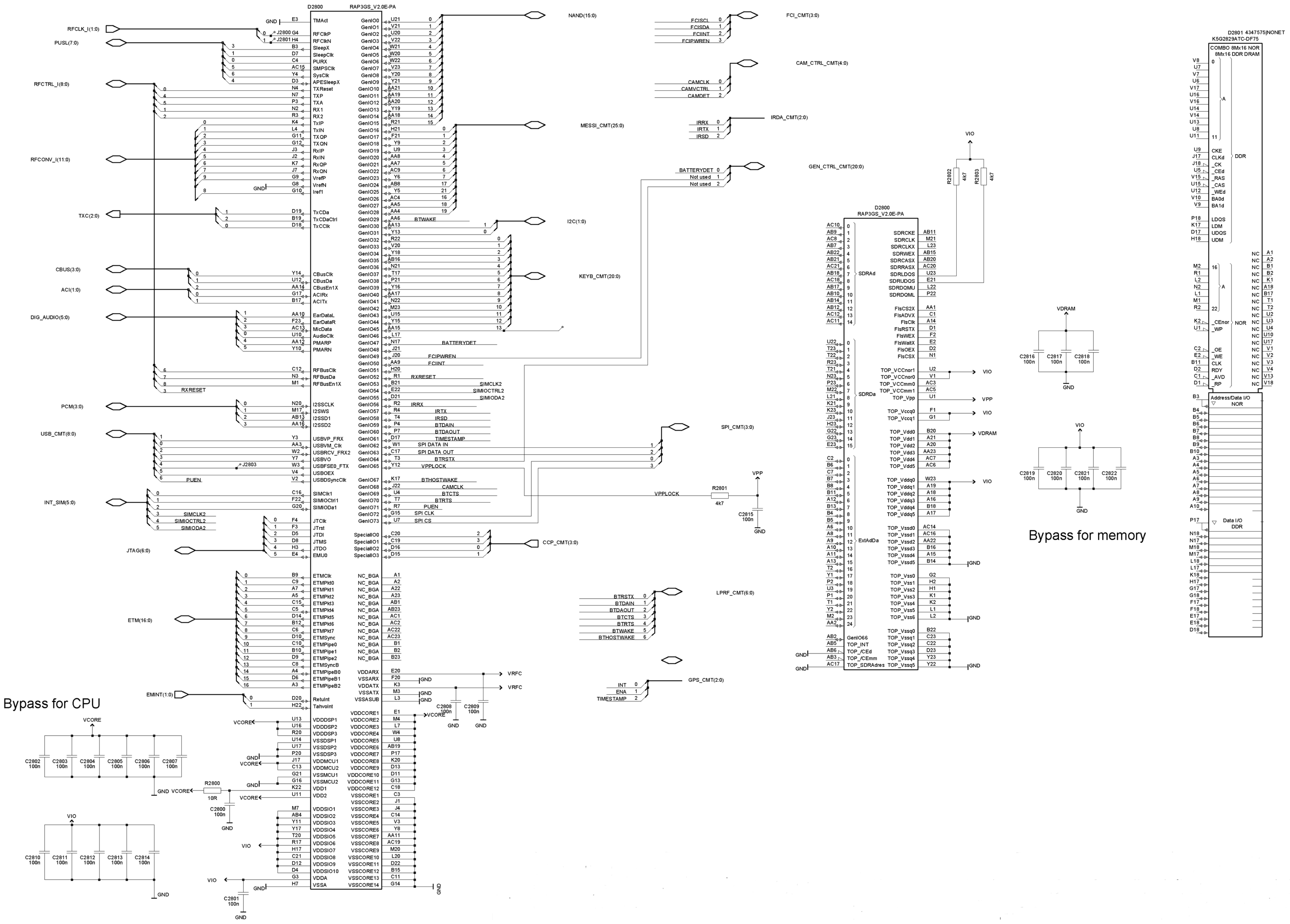
BB top level 2


CMT_IF
schematic
AUDIO(8:0)
H_BRIDGE(3:0)
SIM(6:0)
XAUDIO(7:0)
USB_ACI(7:0)
CHARGER
SLOWAD(6:0)
ETM(16:0)
JTAG(6:0)
SPI_CMT(3:0)
AUDIO(8:0)
H_BRIDGE(3:0)
CMT_ENGINE
schematic
AUDIO(8:0)
H_BRIDGE(3:0)
SIM(6:0)
XAUDIO(7:0)
USB_ACI(7:0)
CHARGER
SLOWAD(6:0)
ETM(16:0)
JTAG(6:0)
LPRFCLK_I
PWRONX
INTUSB(8:0)
PUSL(7:0)
PCM(3:0)
LPRFCLK
RFCLK(1:0)
RFCTRL(8:0)
RFCONV(11:0)
TXCCONV(2:0)
RFPWR(5:0)
LPRF_CMT(6:0)
CAM_CTRL_CMT(4:0)
CCP_CMT(3:0)
MMC_CMT(15:0)
MESSI_CMT(25:0)
KEYB_CMT(20:0)
SPI_CMT(3:0)
FCI_CMT(3:0)
GEN_CTRL_CMT(20:0)
FLEX_AUDIO(3:0)
BETTY_CTRL_CMT(4:0)
PUSL(7:0)
PUSL(7:0)
SLOWAD(6:0)
LPRFCLK
RFCLK(1:0)
RFCTRL(8:0)
RFCONV(11:0)
TXCCONV(2:0)
RFPWR(5:0)
MESSI_CMT(25:0)
GEN_CTRL_CMT(20:0)
FLEX_AUDIO(3:0)
BETTY_CTRL_CMT(4:0)
PCM(3:0)
PUSL(7:0)
INTUSB(8:0)
PWRONX
LPRFCLK_I
SIM(6:0)

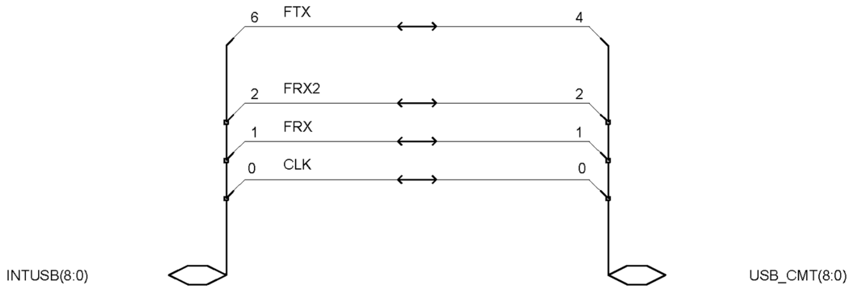
CMT engine top level


SLOWAD(6:0)
LPRFCLK_I
LPRFCLK_I
TXC_CONV_I(2:0)
RF_BB
POWER
basic
RAP
rapstack
GPSCLK
LPRFCLK_I
LPRFCLK
LPRFCLK
TXCCONV_I(2:0)
RFCLK(1:0)
RFCLK(1:0)
RFCLK_I(1:0)
RFCTRL(8:0)
RFCTRL(8:0)
RFCTRL_I(8:0)
RFCONV(11:0)
RFCONV(11:0)
RFCONV_I(11:0)
TXCCONV(2:0)
TXCCONV(2:0)
RFPWR(5:0)
RFPWR(5:0)
AUDIO(8:0)
H_BRIDGE(3:0)
FLEX_AUDIO(3:0)
SIM(6:0)
XAUDIO(7:0)
USB_ACI(7:0)
CHARGER
BETTY_CTRL_CMT(4:0)
SLOWAD(6:0)
TXC_CONV(2:0)
DIG_AUDIO(5:0)
EMINT(1:0)
ACI(1:0)
TXC(2:0)
INT_SIM(5:0)
CBUS(3:0)
PUSL(7:0)
INTUSB(8:0)
PWRONX
DIG_AUDIO(5:0)
EMINT(1:0)
ACI(1:0)
TXC(2:0)
INT_SIM(5:0)
CBUS(3:0)
PUSL(7:0)
I2C(1:0)
PCM(3:0)
JTAG(6:0)
ETM(16:0)
RFCLK_I(1:0)
RFCTRL_I(8:0)
RFCONV_I(11:0)
LPRF_CMT(6:0)
CAM_CTRL_CMT(4:0)
CCP_CMT(3:0)
MMC_CMT(15:0)
MESSI_CMT(25:0)
KEYB_CMT(20:0)
SPI_CMT(3:0)
FCI_CMT(3:0)
GEN_CTRL_CMT(20:0)
USB_CMT(8:0)
NAND(15:0)
LPRF_CMT(6:0)
CAM_CTRL_CMT(4:0)
CCP_CMT(3:0)
MMC_CMT(15:0)
MESSI_CMT(25:0)
KEYB_CMT(20:0)
SPI_CMT(3:0)
FCI_CMT(3:0)
GEN_CTRL_CMT(20:0)
PWRONX
USB_CONN
ape
INTUSB(8:0)
USB_CMT(8:0)
INTUSB(8:0)
PCM(3:0)
ETM(16:0)
JTAG(6:0)
PUSL(7:0)
ETM(16:0)
JTAG(6:0)
PUSL(7:0)

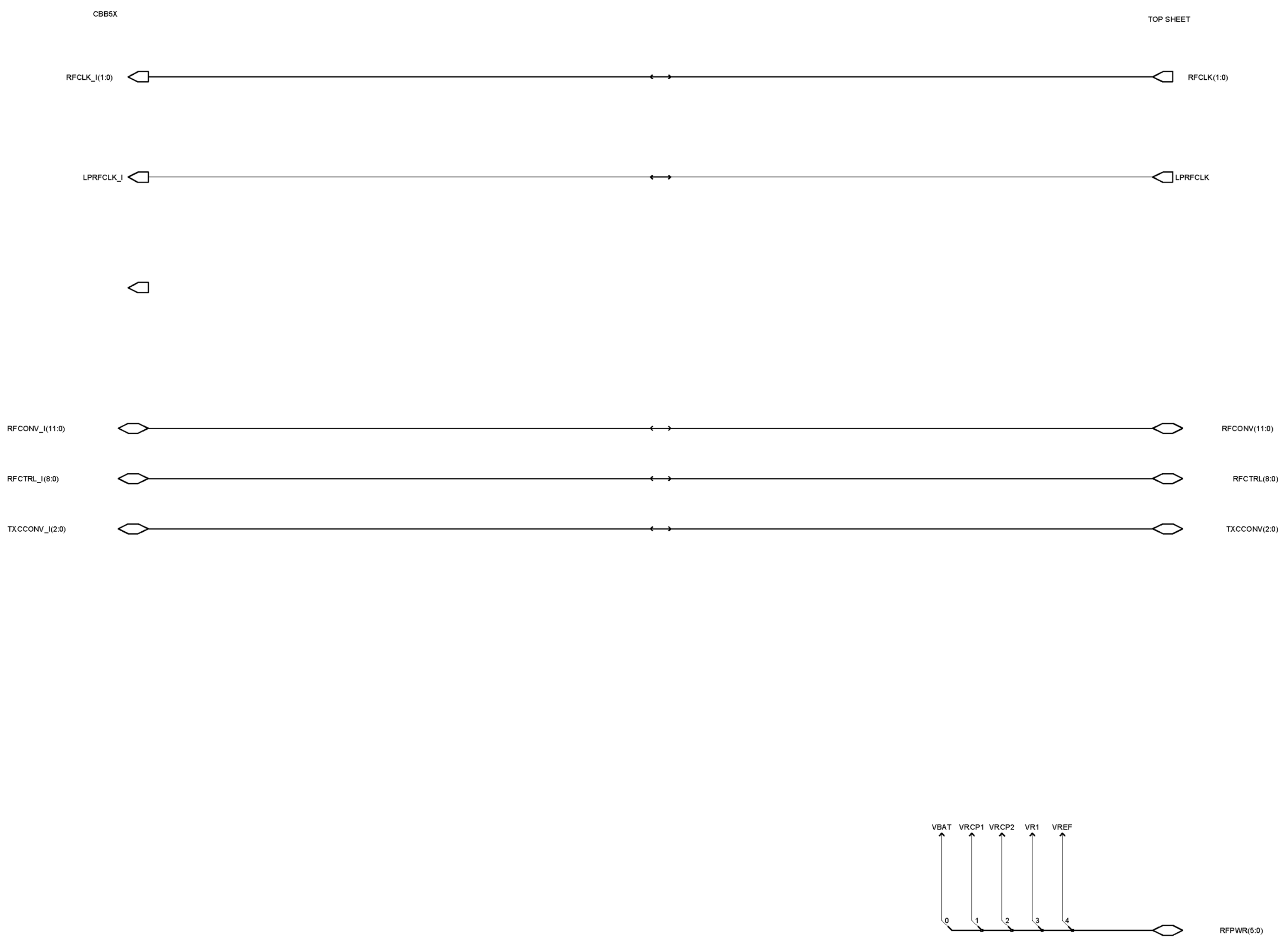
RAPstack for memory


D2800
RAP3GS_V2.0E-PA
RFCLK_I(1:0)
PUSL(7:0)
RFCTRL_I(8:0)
RFCONV_I(11:0)
TXC(2:0)
CBUS(3:0)
ACI(1:0)
DIG_AUDIO(5:0)
PCM(3:0)
USB_CMT(8:0)
INT_SIM(5:0)
JTAG(6:0)
ETM(16:0)
EMINT(1:0)
NAND(15:0)
FCI_CMT(3:0)
CAM_CTRL_CMT(4:0)
IRDA_CMT(2:0)
MESSI_CMT(25:0)
GEN_CTRL_CMT(20:0)
I2C(1:0)
KEYB_CMT(20:0)
SPI_CMT(3:0)
CCP_CMT(3:0)
LPRF_CMT(6:0)
GPS_CMT(2:0)
BATTERYDET
VPPLOCK
RXRESET
SIMCLK2
SIMIOCTRL2
SIMIODA2
BTWAKE
BTHOSTWAKE
VRFC
VCORE
VIO
VPP
VDRAM
GND
R2800
10R
R2801
4k7
R2802
R2803
C2800
C2801
C2802
C2803
C2804
C2805
C2806
C2807
C2808
C2809
C2810
C2811
C2812
C2813
C2814
C2815
C2816
C2817
C2818
C2819
C2820
C2821
C2822
100n
D2800
RAP3GS_V2.0E-PA
SDRAd
SDRDa
ExtAdDa
D2801 4347575|NONET
K5G2829ATC-DF75
COMBO 8Mx16 NOR
8Mx16 DDR DRAM
DDR
NOR
Address/Data I/O
Data I/O
Bypass for CPU
Bypass for memory

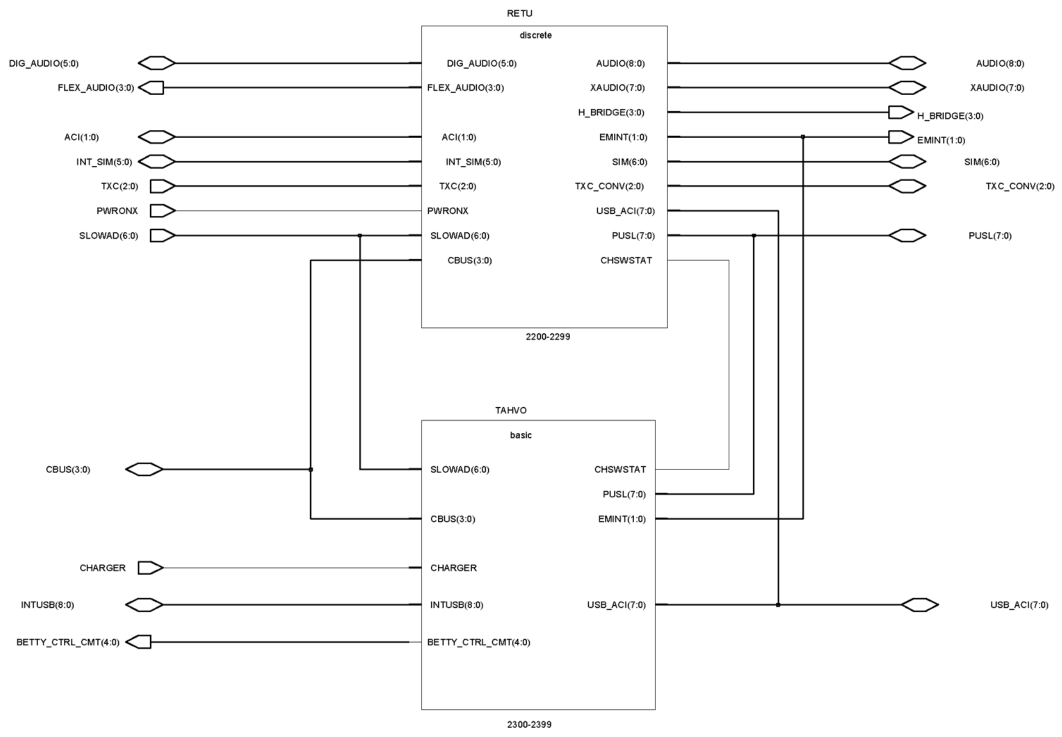
USB connections with APE


6
FTX
4
2
FRX2
2
1
FRX
1
0
CLK
0
INTUSB(8:0)
USB_CMT(8:0)

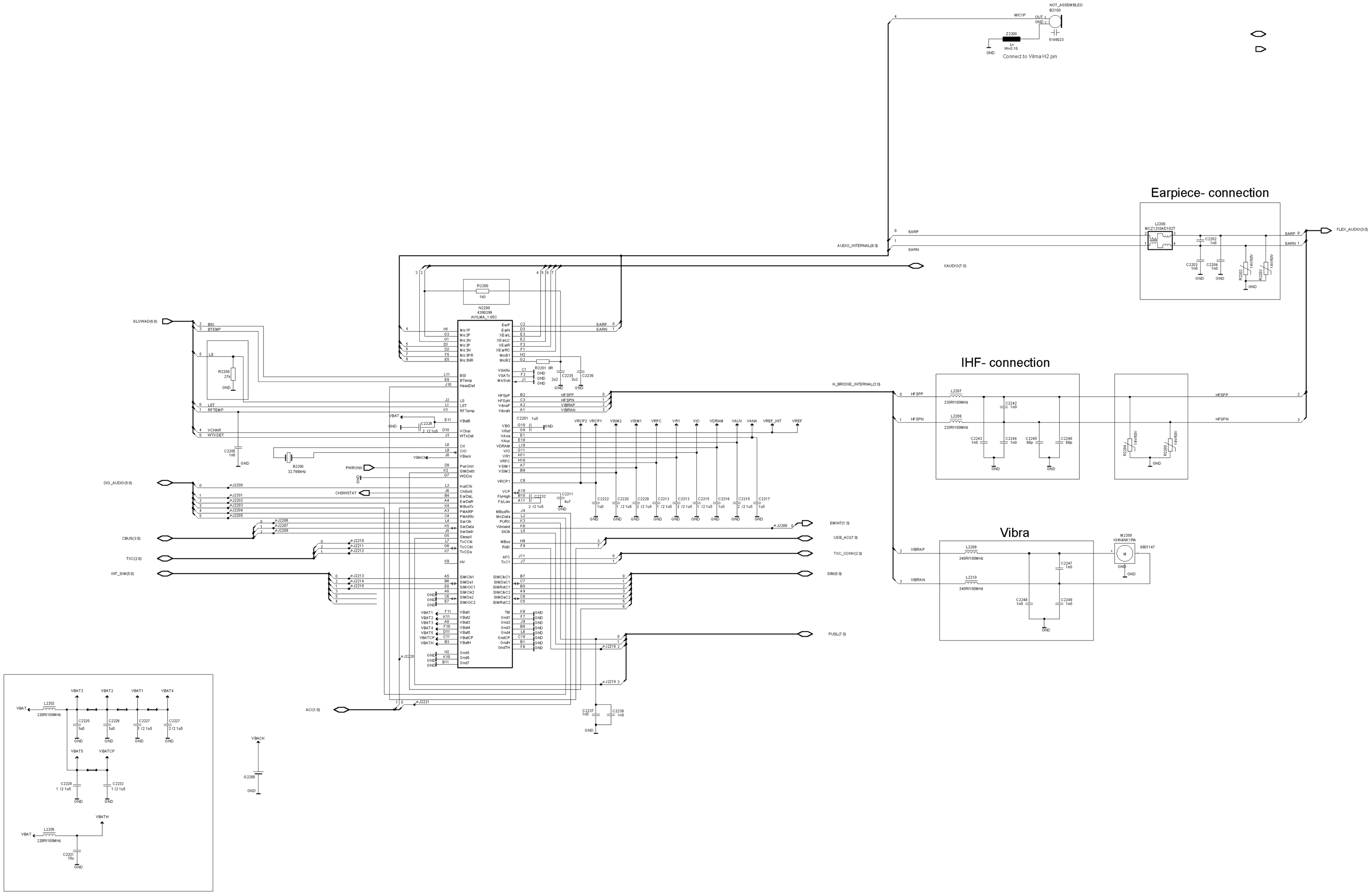
RF IF


CBB5X
TOP SHEET
RFCLK_I(1:0)
RFCLK(1:0)
LPRFCLK_I
LPRFCLK
RFCONV_I(11:0)
RFCONV(11:0)
RFCTRL_I(8:0)
RFCTRL(8:0)
TXCCONV_I(2:0)
TXCCONV(2:0)
VBAT
VRCP1
VRCP2
VR1
VREF
0
1
2
3
4
RFPWR(5:0)

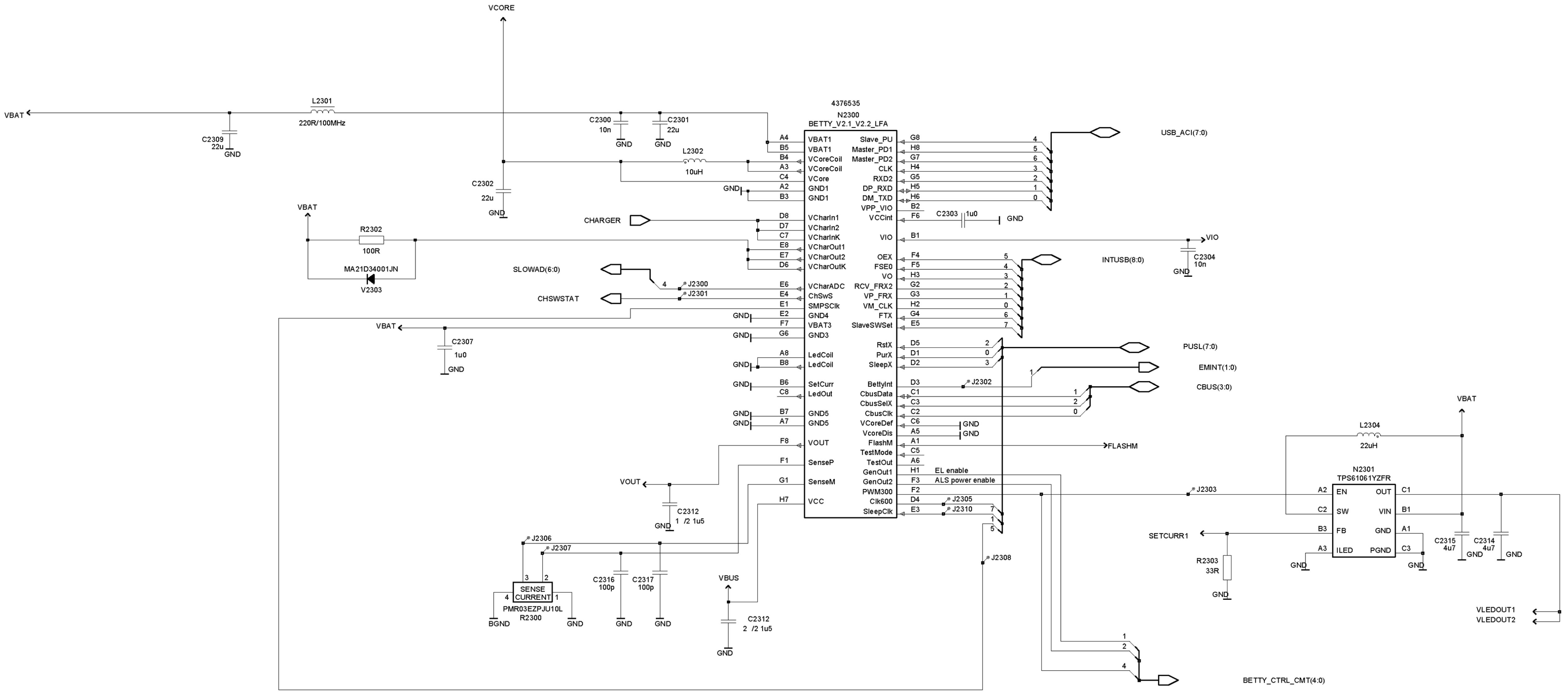
Energy management


RETU
discrete
DIG_AUDIO(5:0)
FLEX_AUDIO(3:0)
ACI(1:0)
INT_SIM(5:0)
TXC(2:0)
PWRONX
SLOWAD(6:0)
CBUS(3:0)
AUDIO(8:0)
XAUDIO(7:0)
H_BRIDGE(3:0)
EMINT(1:0)
SIM(6:0)
TXC_CONV(2:0)
USB_ACI(7:0)
PUSL(7:0)
CHSWSTAT
2200-2299
TAHVO
basic
SLOWAD(6:0)
CBUS(3:0)
CHARGER
INTUSB(8:0)
BETTY_CTRL_CMT(4:0)
CHSWSTAT
PUSL(7:0)
EMINT(1:0)
USB_ACI(7:0)
2300-2399

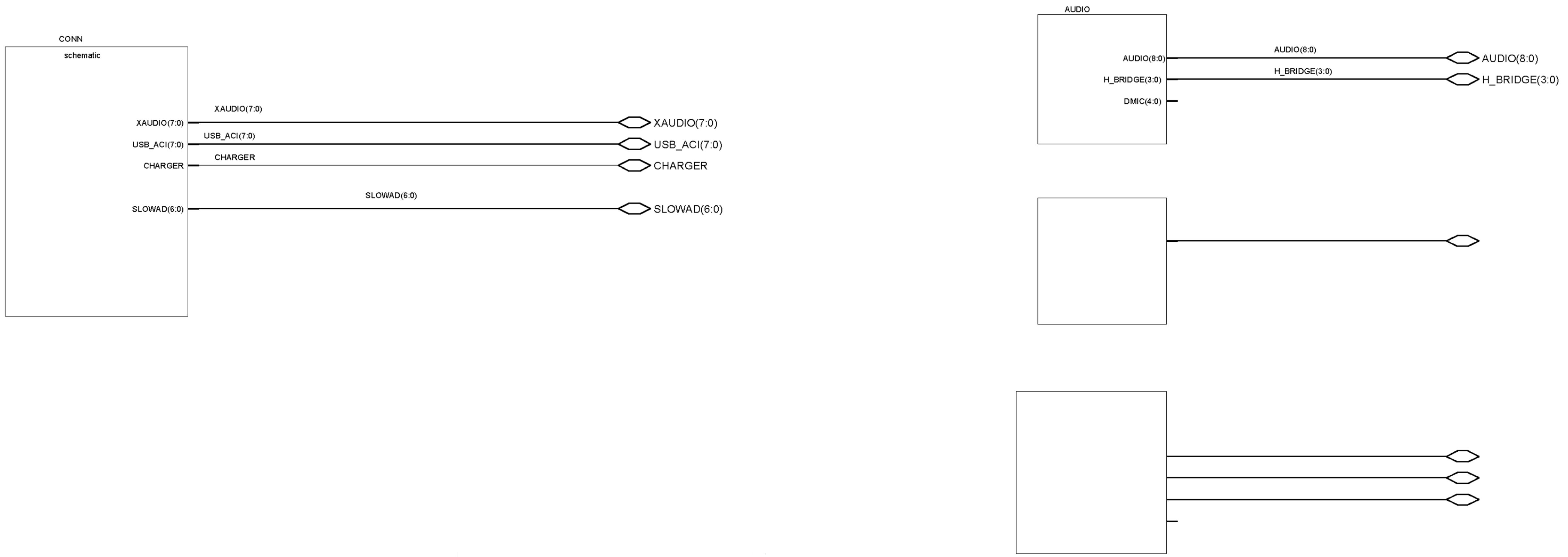
Vilma


NOT_ASSEMBLED
B2100
MIC1P
Z2200
Connect to Vilma H2 pin
Earpiece- connection
L2206
AUDIO_INTERNAL(8:0)
EARP
EARN
FLEX_AUDIO(3:0)
XAUDIO(7:0)
R2200
N2200
AVILMA_1.05C
SLOWAD(6:0)
BSI
BTEMP
R2208
27k
LST
RFTEMP
VCHAR
WTXDET
IHF- connection
H_BRIDGE_INTERNAL(3:0)
HFSPP
HFSPN
L2207
L2208
DIG_AUDIO(5:0)
PWRONX
CHSWSTAT
B2200
32.768kHz
CBUS(3:0)
TXC(2:0)
INT_SIM(5:0)
EMINT(1:0)
USB_ACI(7:0)
TXC_CONV(2:0)
SIM(6:0)
PUSL(7:0)
ACI(1:0)
Vibra
M2200
VIBRAP
VIBRAN
L2209
L2210
VBAT
VBAT1
VBAT2
VBAT3
VBAT4
VBAT5
VBATCP
VBATH
VBACK
L2202
L2205
GND

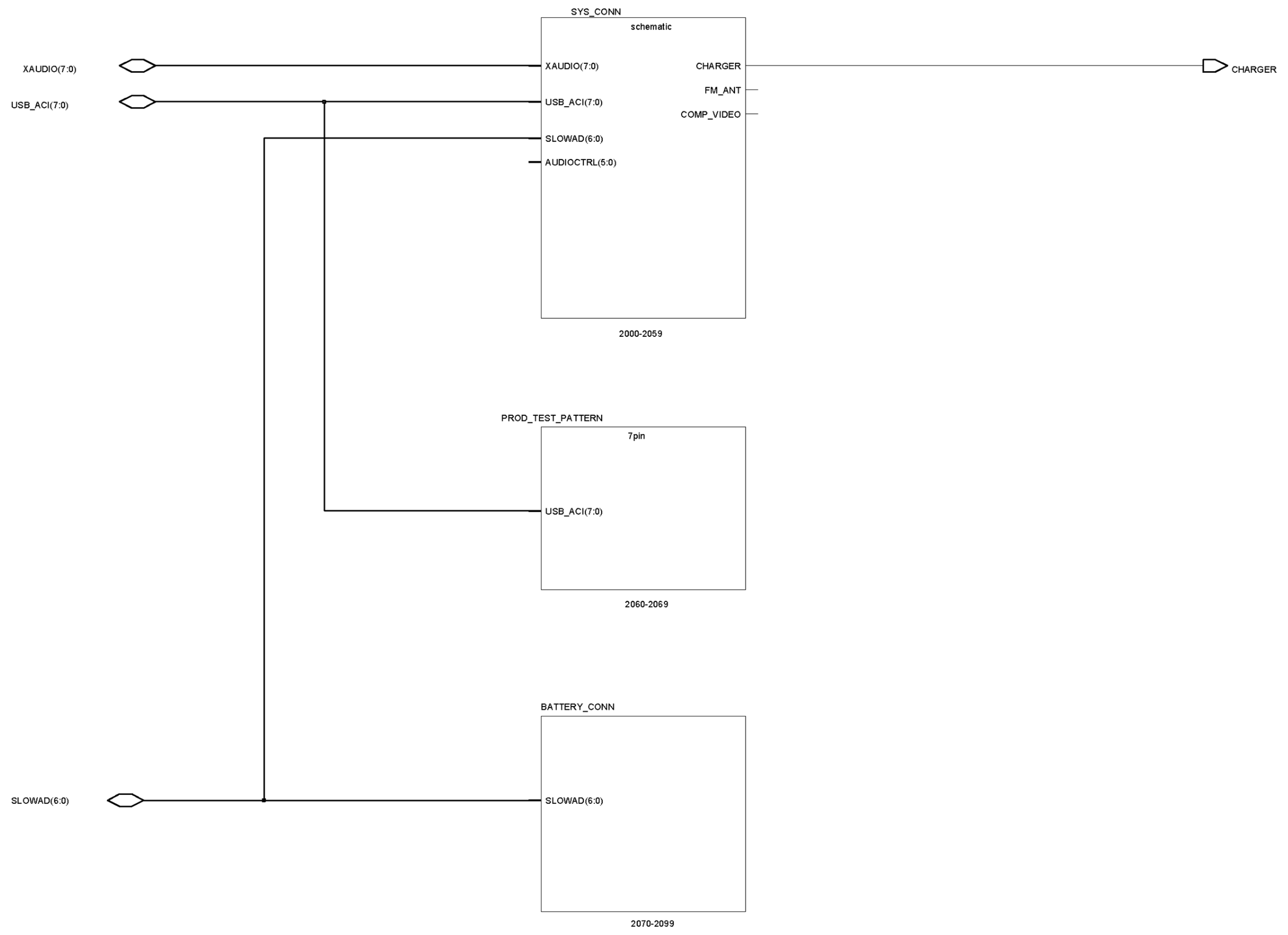
Betty


VCORE
VBAT
L2301
220R/100MHz
C2309
22u
GND
C2300
10n
C2301
22u
L2302
10uH
C2302
22u
4376535
N2300
BETTY_V2.1_V2.2_LFA
VBAT
R2302
100R
MA21D34001JN
V2303
CHARGER
SLOWAD(6:0)
CHSWSTAT
J2300
J2301
VBAT
C2307
1u0
VBAT1
VBAT1
VCoreCoil
VCoreCoil
VCore
GND1
GND1
VCharIn1
VCharIn2
VCharInK
VCharOut1
VCharOut2
VCharOutK
VCharADC
ChSwS
SMPSClk
GND4
VBAT3
GND3
LedCoil
LedCoil
SetCurr
LedOut
GND5
GND5
VOUT
SenseP
SenseM
VCC
Slave_PU
Master_PD1
Master_PD2
CLK
RXD2
DP_RXD
DM_TXD
VPP_VIO
VCCint
VIO
OEX
FSE0
VO
RCV_FRX2
VP_FRX
VM_CLK
FTX
SlaveSWSet
RstX
PurX
SleepX
BettyInt
CbusData
CbusSelX
CbusClk
VCoreDef
VcoreDis
FlashM
TestMode
TestOut
GenOut1
GenOut2
PWM300
Clk600
SleepClk
C2303
1u0
USB_ACI(7:0)
VIO
C2304
10n
INTUSB(8:0)
PUSL(7:0)
EMINT(1:0)
CBUS(3:0)
J2302
FLASHM
EL enable
ALS power enable
J2305
J2310
J2303
J2308
VOUT
C2312
1 /2 1u5
J2306
J2307
SENSE
CURRENT
PMR03EZPJU10L
R2300
BGND
C2316
100p
C2317
100p
VBUS
C2312
2 /2 1u5
BETTY_CTRL_CMT(4:0)
VBAT
L2304
22uH
N2301
TPS61061YZFR
EN
OUT
SW
VIN
FB
GND
ILED
PGND
SETCURR1
R2303
33R
C2315
4u7
C2314
4u7
VLEDOUT1
VLEDOUT2

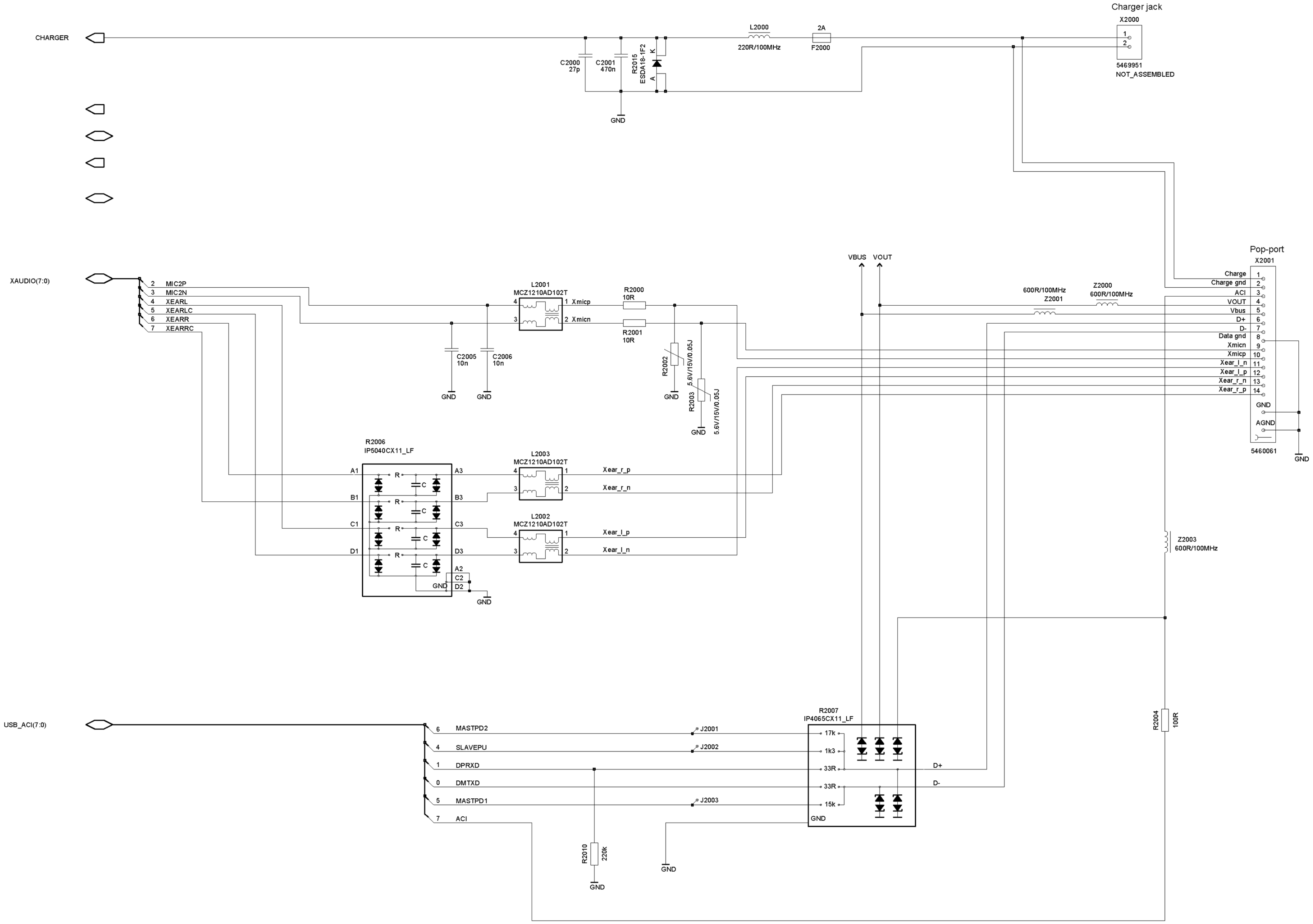
CMT IF top level


CONN
schematic
XAUDIO(7:0)
USB_ACI(7:0)
CHARGER
SLOWAD(6:0)
XAUDIO(7:0)
USB_ACI(7:0)
CHARGER
SLOWAD(6:0)
XAUDIO(7:0)
USB_ACI(7:0)
CHARGER
SLOWAD(6:0)
AUDIO
AUDIO(8:0)
H_BRIDGE(3:0)
DMIC(4:0)
AUDIO(8:0)
H_BRIDGE(3:0)
AUDIO(8:0)
H_BRIDGE(3:0)

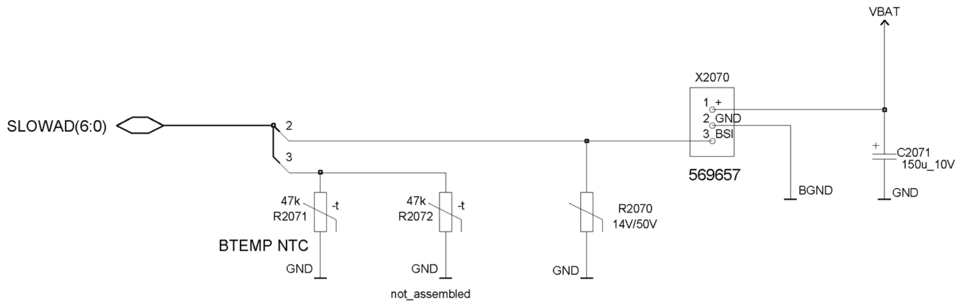
System and battery connector


SYS_CONN
schematic
XAUDIO(7:0)
USB_ACI(7:0)
XAUDIO(7:0)
USB_ACI(7:0)
SLOWAD(6:0)
AUDIOCTRL(5:0)
CHARGER
FM_ANT
COMP_VIDEO
CHARGER
2000-2059
PROD_TEST_PATTERN
7pin
USB_ACI(7:0)
2060-2069
BATTERY_CONN
SLOWAD(6:0)
SLOWAD(6:0)
2070-2099

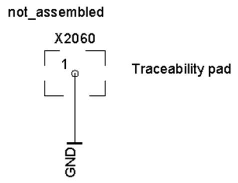
System connector

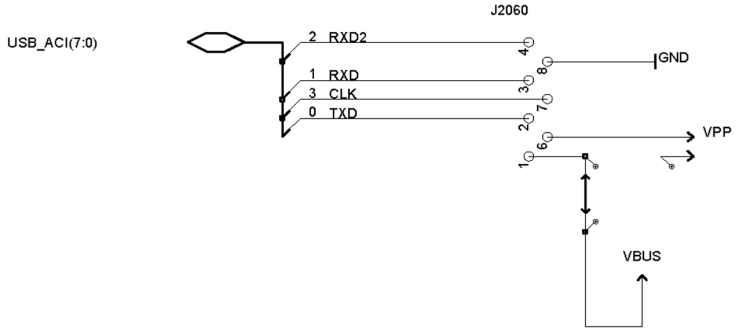

CHARGER
C2000
27p
C2001
470n
GND
R2015
ESDA18-1F2
K
A
L2000
220R/100MHz
2A
F2000
Charger jack
X2000
1
2
5469951
NOT_ASSEMBLED
XAUDIO(7:0)
2 MIC2P
3 MIC2N
4 XEARL
5 XEARLC
6 XEARR
7 XEARRC
L2001
MCZ1210AD102T
1 Xmicp
2 Xmicn
R2000
10R
R2001
10R
C2005
10n
C2006
10n
R2002
5.6V/15V/0.05J
R2003
5.6V/15V/0.05J
VBUS
VOUT
600R/100MHz
Z2001
Z2000
600R/100MHz
Pop-port
X2001
Charge 1
Charge gnd 2
ACI 3
VOUT 4
Vbus 5
D+ 6
D- 7
Data gnd 8
Xmicn 9
Xmicp 10
Xear_l_n 11
Xear_l_p 12
Xear_r_n 13
Xear_r_p 14
GND
AGND
5460061
R2006
IP5040CX11_LF
A1
B1
C1
D1
A3
B3
C3
D3
A2
C2
D2
R
C
L2003
MCZ1210AD102T
Xear_r_p
Xear_r_n
L2002
MCZ1210AD102T
Xear_l_p
Xear_l_n
Z2003
600R/100MHz
USB_ACI(7:0)
6 MASTPD2
4 SLAVEPU
1 DPRXD
0 DMTXD
5 MASTPD1
7 ACI
J2001
J2002
J2003
R2007
IP4065CX11_LF
17k
1k3
33R
33R
15k
D+
D-
R2010
220k
R2004
100R

Battery connector

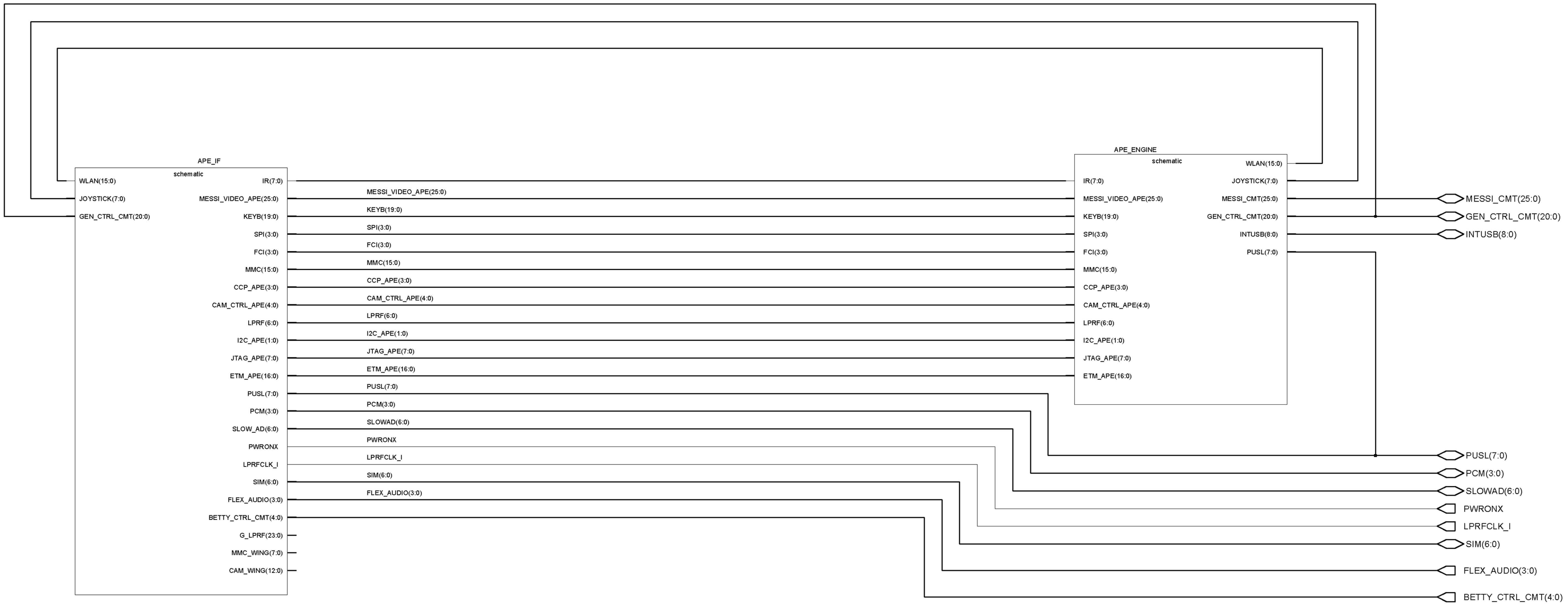

VBAT
X2070
1 +
2 GND
3 BSI
569657
SLOWAD(6:0)
2
3
47k
R2071
-t
BTEMP NTC
GND
47k
R2072
-t
GND
not_assembled
R2070
14V/50V
GND
BGND
+
C2071
150u_10V
GND

Test pad

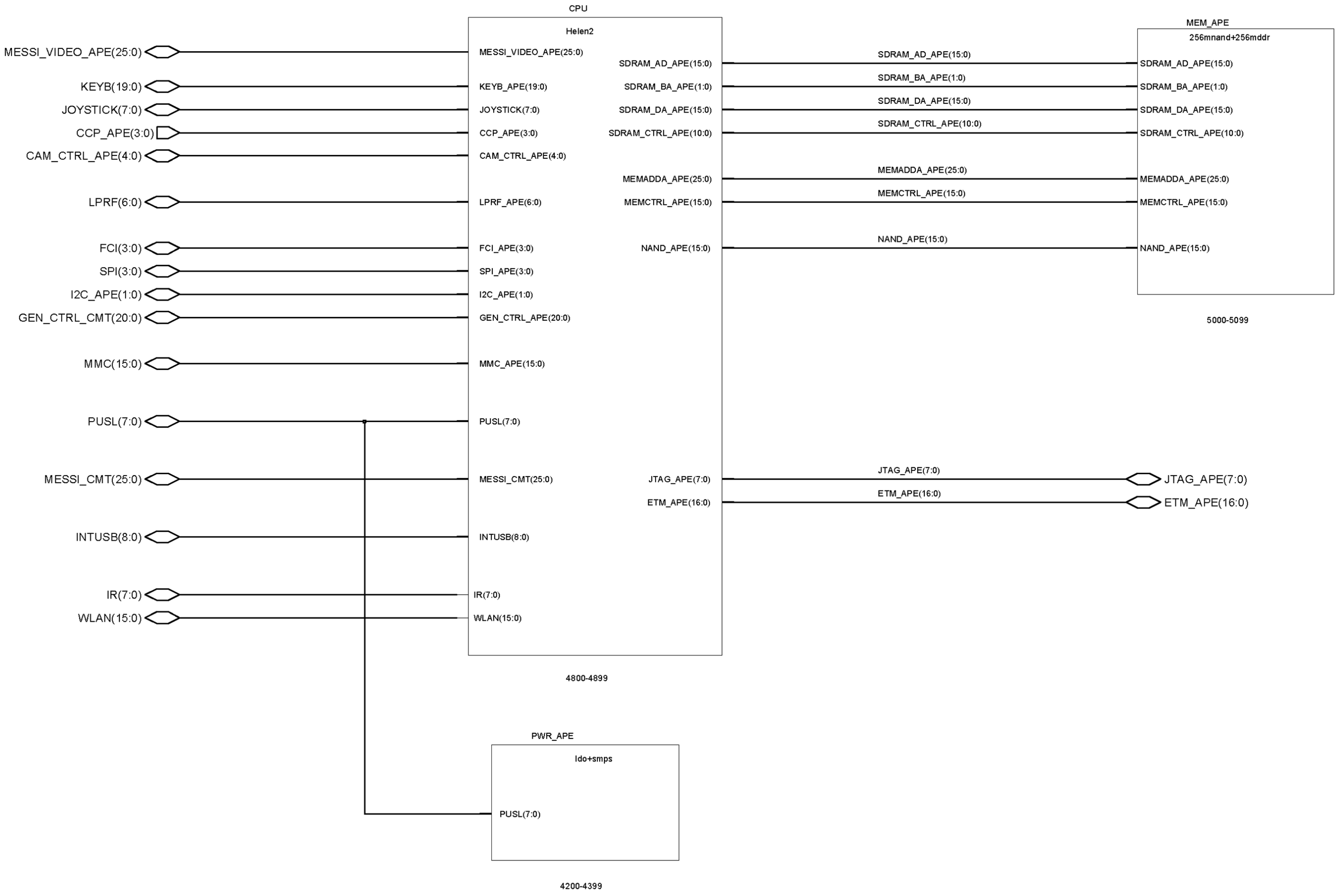

not_assembled
X2060
1
Traceability pad
GND


J2060
USB_ACI(7:0)
2 RXD2
1 RXD
3 CLK
0 TXD
4
8
3
7
2
6
1
GND
VPP
VBUS

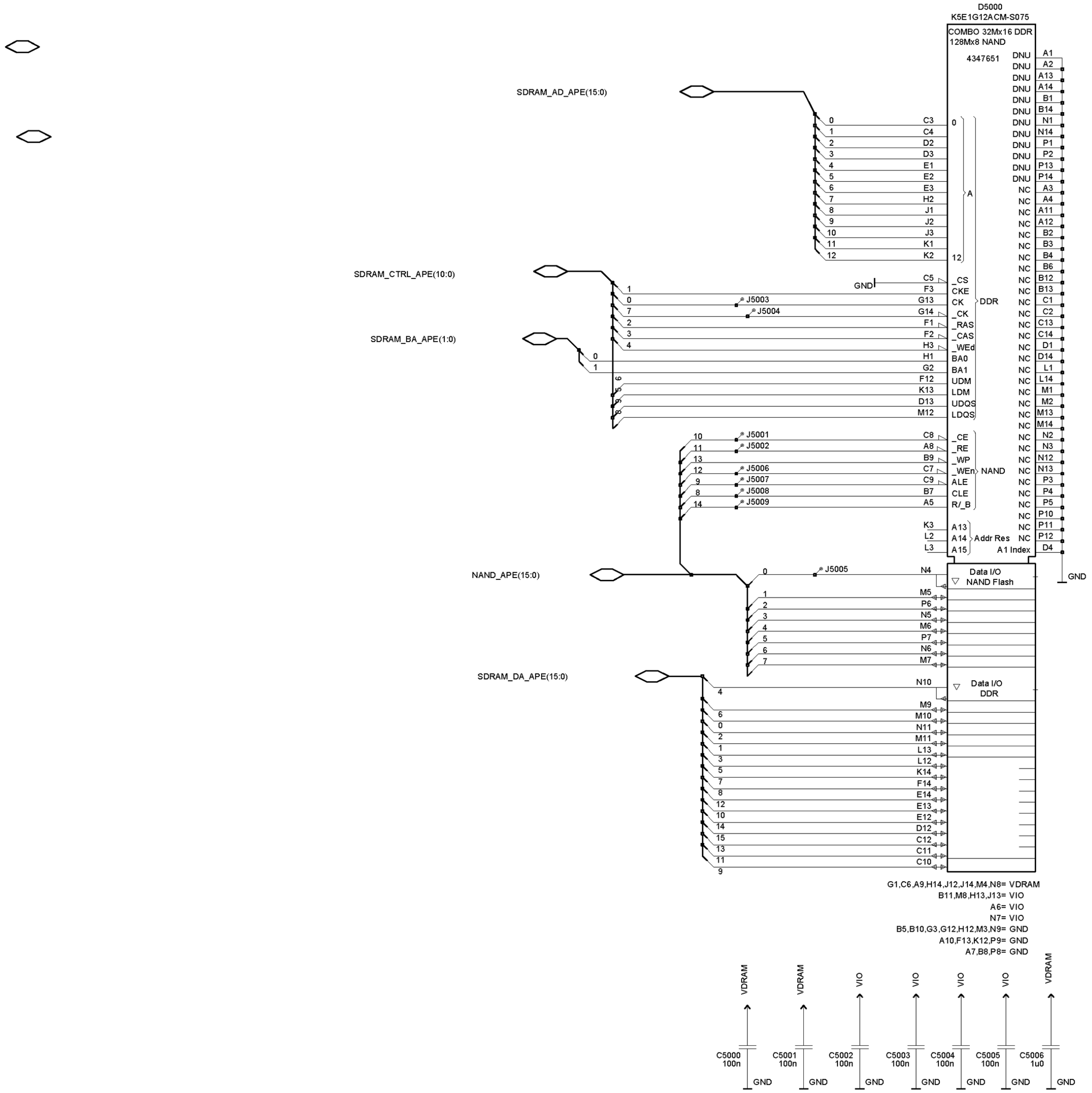
Application engine top level


APE_IF
schematic
WLAN(15:0)
JOYSTICK(7:0)
GEN_CTRL_CMT(20:0)
IR(7:0)
MESSI_VIDEO_APE(25:0)
KEYB(19:0)
SPI(3:0)
FCI(3:0)
MMC(15:0)
CCP_APE(3:0)
CAM_CTRL_APE(4:0)
LPRF(6:0)
I2C_APE(1:0)
JTAG_APE(7:0)
ETM_APE(16:0)
PUSL(7:0)
PCM(3:0)
SLOW_AD(6:0)
PWRONX
LPRFCLK_I
SIM(6:0)
FLEX_AUDIO(3:0)
BETTY_CTRL_CMT(4:0)
G_LPRF(23:0)
MMC_WING(7:0)
CAM_WING(12:0)
MESSI_VIDEO_APE(25:0)
KEYB(19:0)
SPI(3:0)
FCI(3:0)
MMC(15:0)
CCP_APE(3:0)
CAM_CTRL_APE(4:0)
LPRF(6:0)
I2C_APE(1:0)
JTAG_APE(7:0)
ETM_APE(16:0)
PUSL(7:0)
PCM(3:0)
SLOWAD(6:0)
PWRONX
LPRFCLK_I
SIM(6:0)
FLEX_AUDIO(3:0)
APE_ENGINE
schematic
WLAN(15:0)
IR(7:0)
MESSI_VIDEO_APE(25:0)
KEYB(19:0)
SPI(3:0)
FCI(3:0)
MMC(15:0)
CCP_APE(3:0)
CAM_CTRL_APE(4:0)
LPRF(6:0)
I2C_APE(1:0)
JTAG_APE(7:0)
ETM_APE(16:0)
JOYSTICK(7:0)
MESSI_CMT(25:0)
GEN_CTRL_CMT(20:0)
INTUSB(8:0)
PUSL(7:0)
MESSI_CMT(25:0)
GEN_CTRL_CMT(20:0)
INTUSB(8:0)
PUSL(7:0)
PCM(3:0)
SLOWAD(6:0)
PWRONX
LPRFCLK_I
SIM(6:0)
FLEX_AUDIO(3:0)
BETTY_CTRL_CMT(4:0)

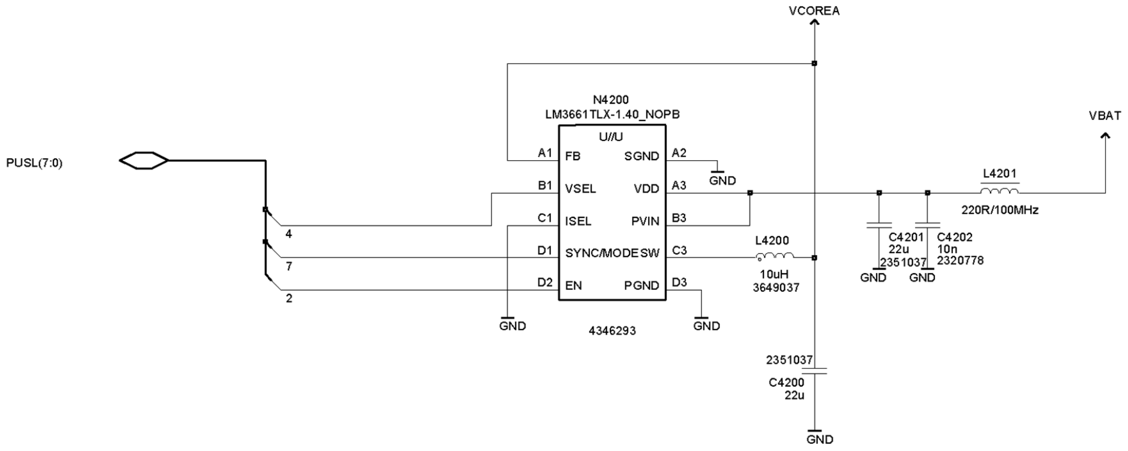
APE engine


CPU
Helen2
MESSI_VIDEO_APE(25:0)
MESSI_VIDEO_APE(25:0)
KEYB(19:0)
KEYB_APE(19:0)
JOYSTICK(7:0)
JOYSTICK(7:0)
CCP_APE(3:0)
CCP_APE(3:0)
CAM_CTRL_APE(4:0)
CAM_CTRL_APE(4:0)
LPRF(6:0)
LPRF_APE(6:0)
FCI(3:0)
FCI_APE(3:0)
SPI(3:0)
SPI_APE(3:0)
I2C_APE(1:0)
I2C_APE(1:0)
GEN_CTRL_CMT(20:0)
GEN_CTRL_APE(20:0)
MMC(15:0)
MMC_APE(15:0)
PUSL(7:0)
PUSL(7:0)
MESSI_CMT(25:0)
MESSI_CMT(25:0)
INTUSB(8:0)
INTUSB(8:0)
IR(7:0)
IR(7:0)
WLAN(15:0)
WLAN(15:0)
SDRAM_AD_APE(15:0)
SDRAM_BA_APE(1:0)
SDRAM_DA_APE(15:0)
SDRAM_CTRL_APE(10:0)
MEMADDA_APE(25:0)
MEMCTRL_APE(15:0)
NAND_APE(15:0)
JTAG_APE(7:0)
ETM_APE(16:0)
4800-4899
SDRAM_AD_APE(15:0)
SDRAM_BA_APE(1:0)
SDRAM_DA_APE(15:0)
SDRAM_CTRL_APE(10:0)
MEMADDA_APE(25:0)
MEMCTRL_APE(15:0)
NAND_APE(15:0)
JTAG_APE(7:0)
ETM_APE(16:0)
MEM_APE
256mnand+256mddr
SDRAM_AD_APE(15:0)
SDRAM_BA_APE(1:0)
SDRAM_DA_APE(15:0)
SDRAM_CTRL_APE(10:0)
MEMADDA_APE(25:0)
MEMCTRL_APE(15:0)
NAND_APE(15:0)
5000-5099
JTAG_APE(7:0)
ETM_APE(16:0)
PWR_APE
ldo+smps
PUSL(7:0)
4200-4399

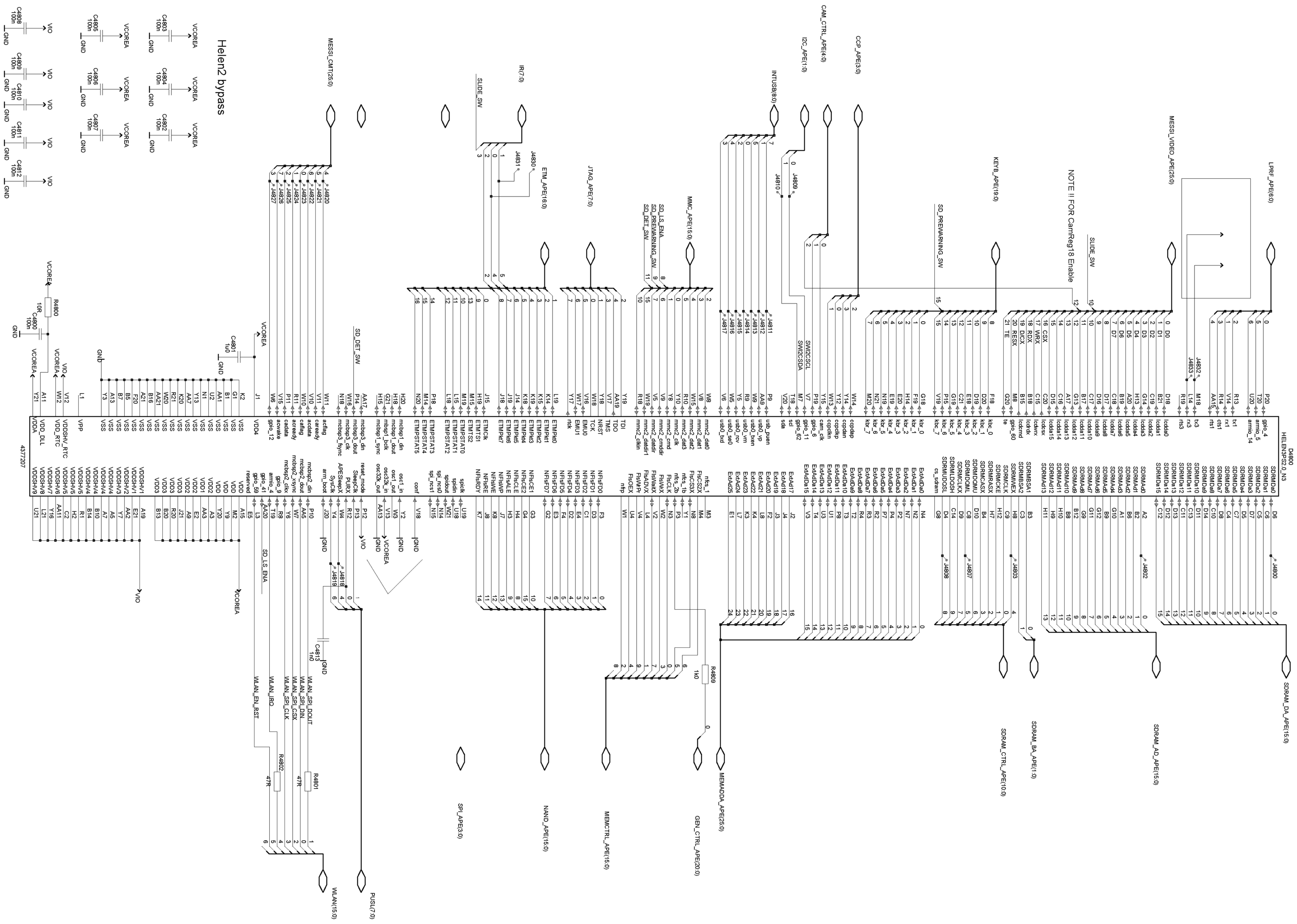
APE memories


D5000
K5E1G12ACM-S075
COMBO 32Mx16 DDR
128Mx8 NAND
4347651
SDRAM_AD_APE(15:0)
SDRAM_CTRL_APE(10:0)
SDRAM_BA_APE(1:0)
NAND_APE(15:0)
SDRAM_DA_APE(15:0)
A
DDR
NAND
_CS
CKE
CK
_CK
_RAS
_CAS
_WEd
BA0
BA1
UDM
LDM
UDQS
LDQS
_CE
_RE
_WP
_WEn
ALE
CLE
R/_B
A13
A14
A15
Addr Res
A1 Index
Data I/O
NAND Flash
Data I/O
DDR
DNU
NC
GND
J5001
J5002
J5003
J5004
J5005
J5006
J5007
J5008
J5009
G1,C6,A9,H14,J12,J14,M4,N8= VDRAM
B11,M8,H13,J13= VIO
A6= VIO
N7= VIO
B5,B10,G3,G12,H12,M3,N9= GND
A10,F13,K12,P9= GND
A7,B8,P8= GND
VDRAM
VIO
C5000
100n
C5001
100n
C5002
100n
C5003
100n
C5004
100n
C5005
100n
C5006
1u0

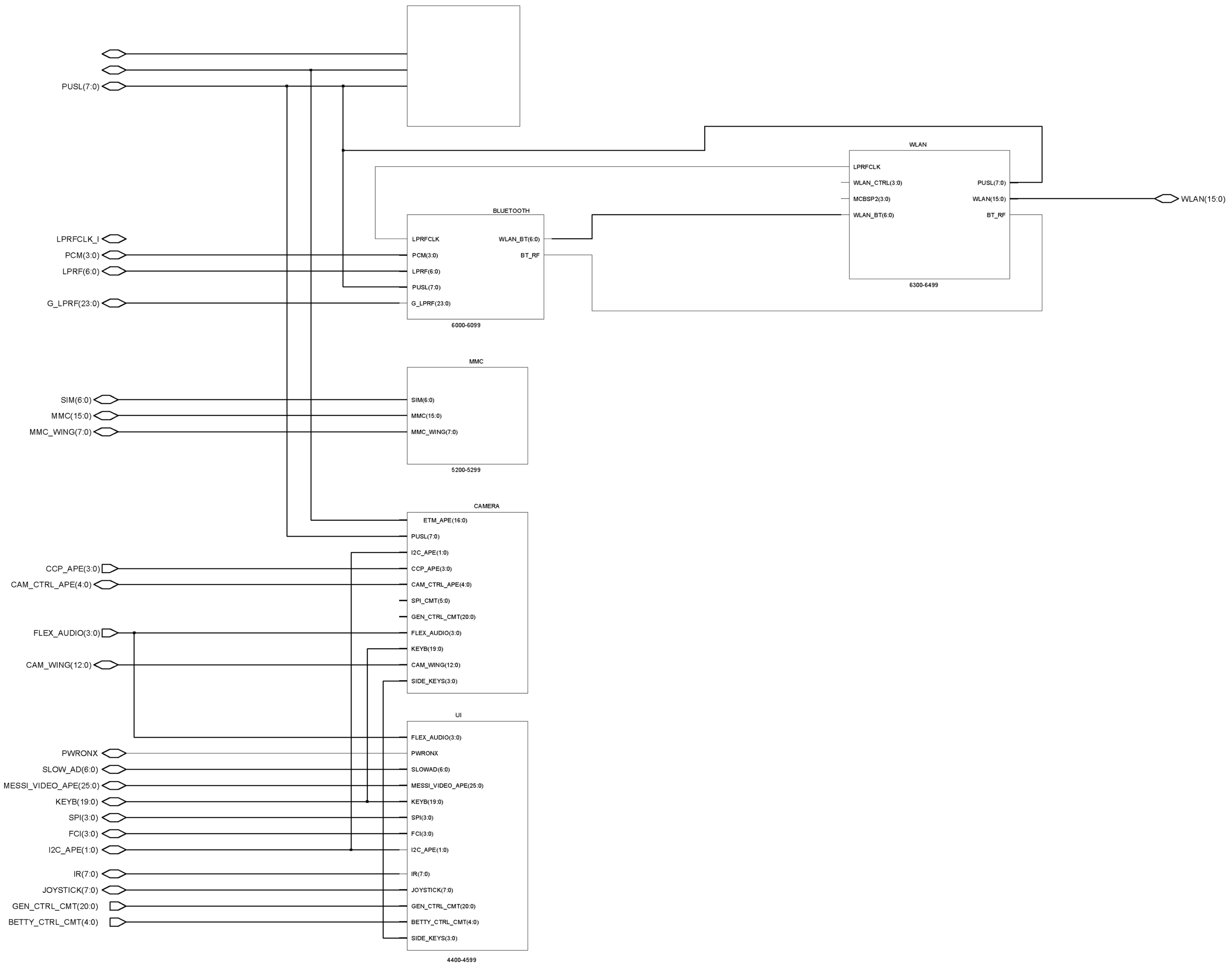
Regulators


VCOREA
N4200
LM3661TLX-1.40_NOPB
U//U
PUSL(7:0)
A1
FB
SGND
A2
GND
B1
VSEL
VDD
A3
C1
ISEL
PVIN
B3
D1
SYNC/MODE
SW
C3
D2
EN
PGND
D3
4
7
2
GND
4346293
GND
L4200
10uH
3649037
VBAT
L4201
220R/100MHz
C4201
22u
2351037
GND
C4202
10n
2320778
GND
2351037
C4200
22u
GND

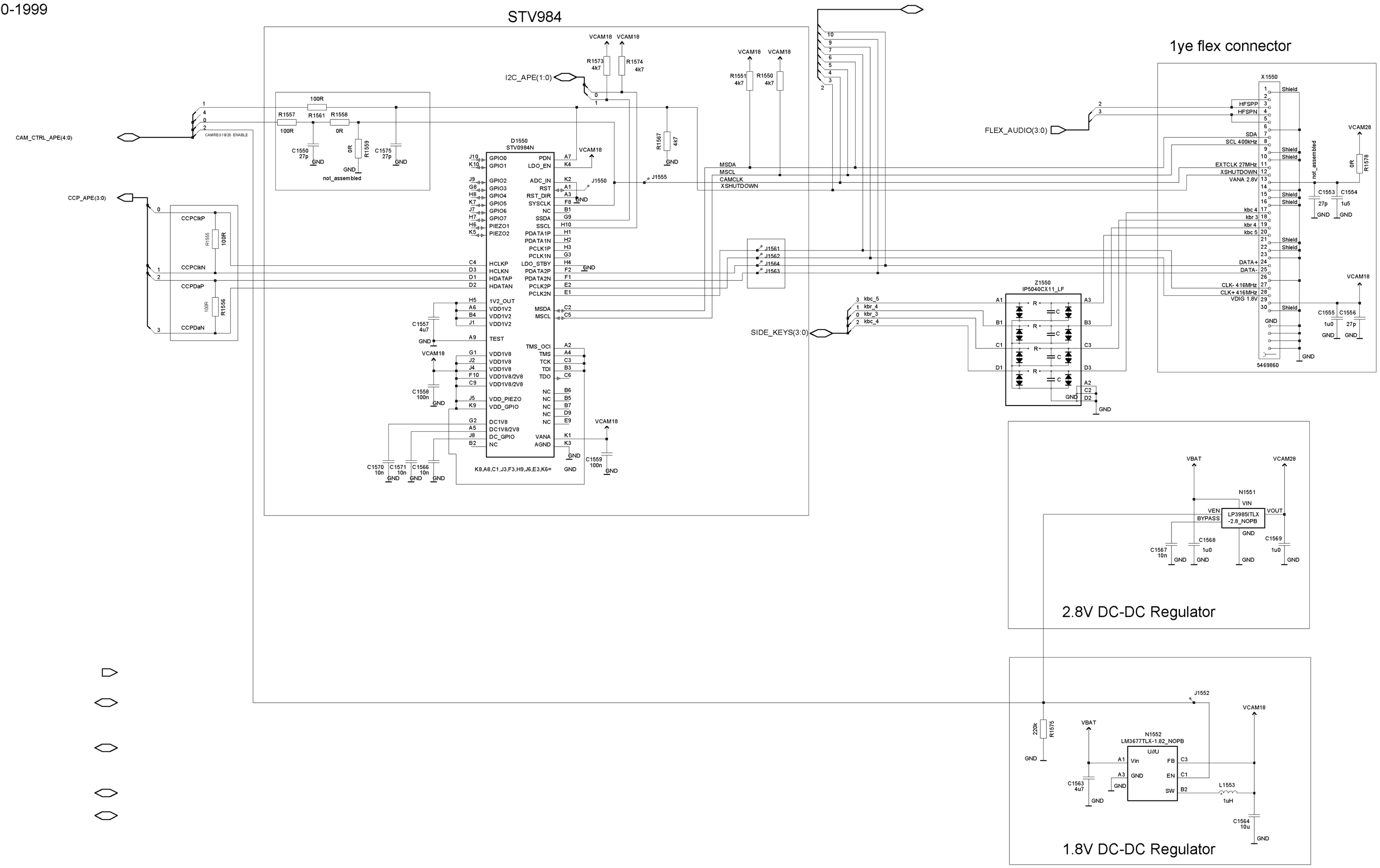
Helen


Helen2 bypass
D4800
HELEN3PS2.0_N3
4377207
MESSI_CMT(25:0)
IR(7:0)
SLIDE_SW
ETM_APE(16:0)
JTAG_APE(7:0)
MMC_APE(15:0)
SD_LS_ENA
SD_PREWARNING_SW
SD_DET_SW
INTUSB(8:0)
I2C_APE(1:0)
CAM_CTRL_APE(4:0)
CCP_APE(3:0)
KEYB_APE(19:0)
NOTE !! FOR CamReg18 Enable
MESSI_VIDEO_APE(25:0)
LPRF_APE(6:0)
SDRAM_DA_APE(15:0)
SDRAM_AD_APE(15:0)
SDRAM_BA_APE(1:0)
SDRAM_CTRL_APE(10:0)
MEMADDA_APE(25:0)
GEN_CTRL_APE(20:0)
MEMCTRL_APE(15:0)
NAND_APE(15:0)
SPI_APE(3:0)
PUSL(7:0)
WLAN(15:0)
WLAN_SPI_DOUT
WLAN_SPI_DIN
WLAN_SPI_CSX
WLAN_SPI_CLK
WLAN_IRQ
WLAN_EN_RST
R4800
10k
R4801
47R
R4802
47R
R4809
1k0
C4800
C4801
C4802
C4803
C4804
C4805
C4806
C4807
C4808
C4809
C4810
C4811
C4812
C4813
100n
1n0
VCOREA
VIO
GND

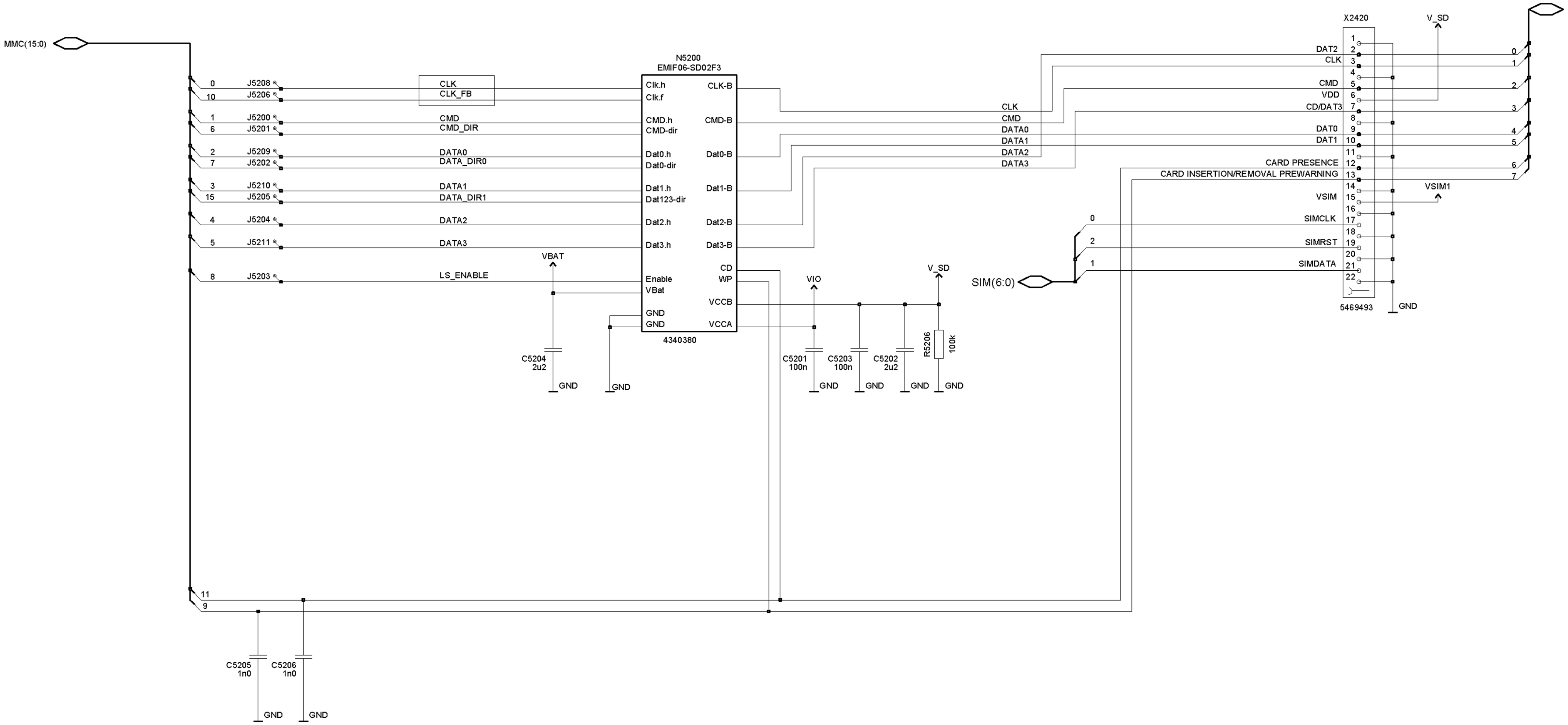
APE IF


PUSL(7:0)
WLAN
LPRFCLK
WLAN_CTRL(3:0)
MCBSP2(3:0)
WLAN_BT(6:0)
PUSL(7:0)
WLAN(15:0)
BT_RF
6300-6499
WLAN(15:0)
BLUETOOTH
LPRFCLK_I
PCM(3:0)
LPRF(6:0)
G_LPRF(23:0)
LPRFCLK
PCM(3:0)
LPRF(6:0)
PUSL(7:0)
G_LPRF(23:0)
WLAN_BT(6:0)
BT_RF
6000-6099
MMC
SIM(6:0)
MMC(15:0)
MMC_WING(7:0)
SIM(6:0)
MMC(15:0)
MMC_WING(7:0)
5200-5299
CAMERA
ETM_APE(16:0)
PUSL(7:0)
I2C_APE(1:0)
CCP_APE(3:0)
CAM_CTRL_APE(4:0)
SPI_CMT(5:0)
GEN_CTRL_CMT(20:0)
FLEX_AUDIO(3:0)
KEYB(19:0)
CAM_WING(12:0)
SIDE_KEYS(3:0)
CCP_APE(3:0)
CAM_CTRL_APE(4:0)
FLEX_AUDIO(3:0)
CAM_WING(12:0)
UI
FLEX_AUDIO(3:0)
PWRONX
SLOWAD(6:0)
MESSI_VIDEO_APE(25:0)
KEYB(19:0)
SPI(3:0)
FCI(3:0)
I2C_APE(1:0)
IR(7:0)
JOYSTICK(7:0)
GEN_CTRL_CMT(20:0)
BETTY_CTRL_CMT(4:0)
SIDE_KEYS(3:0)
4400-4599
PWRONX
SLOW_AD(6:0)
MESSI_VIDEO_APE(25:0)
KEYB(19:0)
SPI(3:0)
FCI(3:0)
I2C_APE(1:0)
IR(7:0)
JOYSTICK(7:0)
GEN_CTRL_CMT(20:0)
BETTY_CTRL_CMT(4:0)

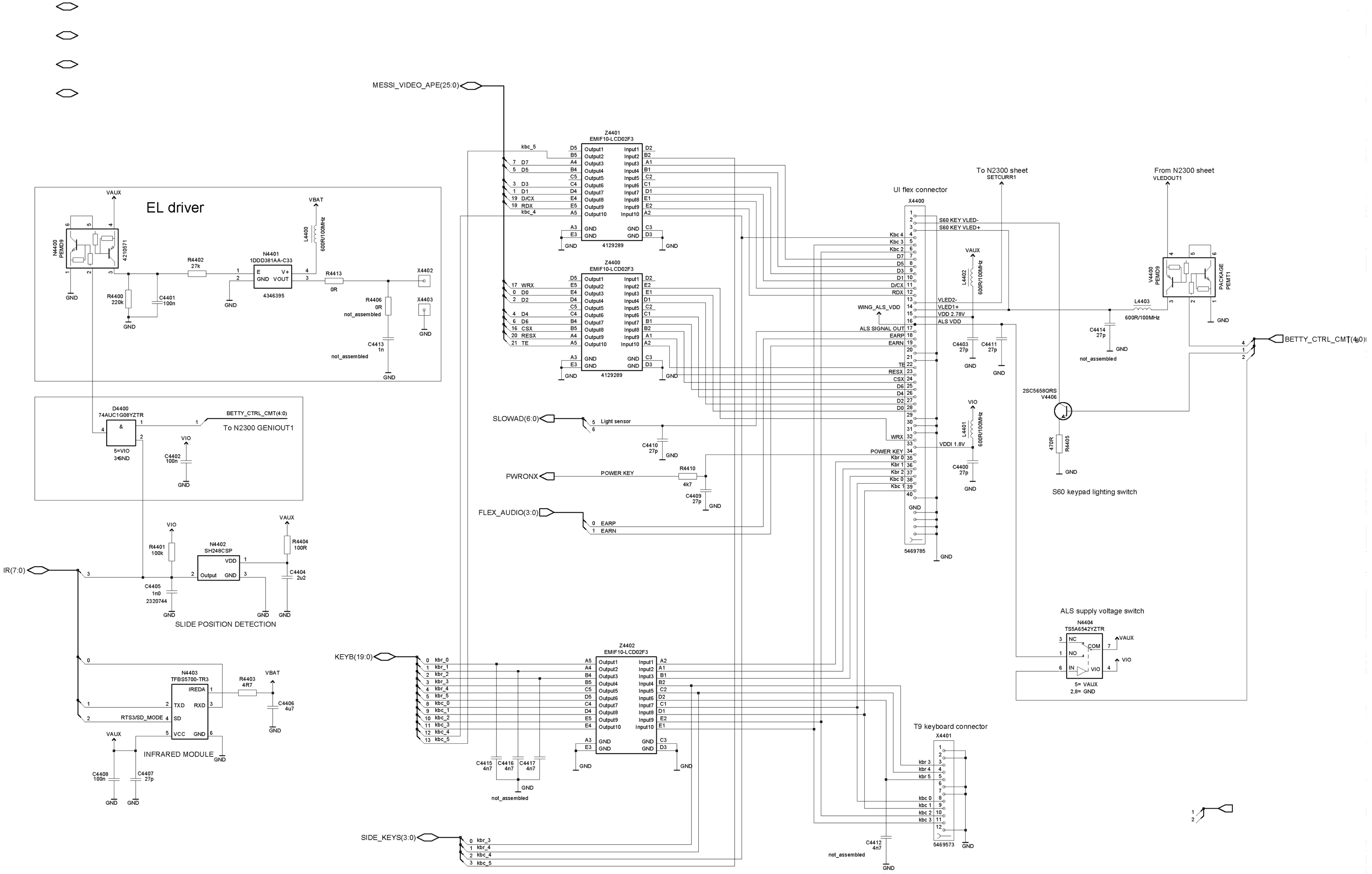
STV984 + SMIA85


1500-1999
STV984
1ye flex connector
2.8V DC-DC Regulator
1.8V DC-DC Regulator
CAM_CTRL_APE(4:0)
CCP_APE(3:0)
I2C_APE(1:0)
FLEX_AUDIO(3:0)
SIDE_KEYS(3:0)
D1550
STV0984N
X1550
5469860
Z1550
IP5040CX11_LF
N1551
LP3985ITLX-2.8_NOPB
N1552
LM3677TLX-1.82_NOPB
VCAM18
VCAM28
VBAT
GND
not_assembled
CAMREG18/28_ENABLE
MSDA
MSCL
CAMCLK
XSHUTDOWN
HFSPP
HFSPN
SDA
SCL 400kHz
EXTCLK 27MHz
XSHUTDOWN
VANA 2.8V
DATA+
DATA-
CLK- 416MHz
CLK+ 416MHz
VDIG 1.8V
Shield
J1550
J1552
J1555
J1561
J1562
J1563
J1564
L1553
1uH
K8,A8,C1,J3,F3,H9,J6,E3,K6=

MMC

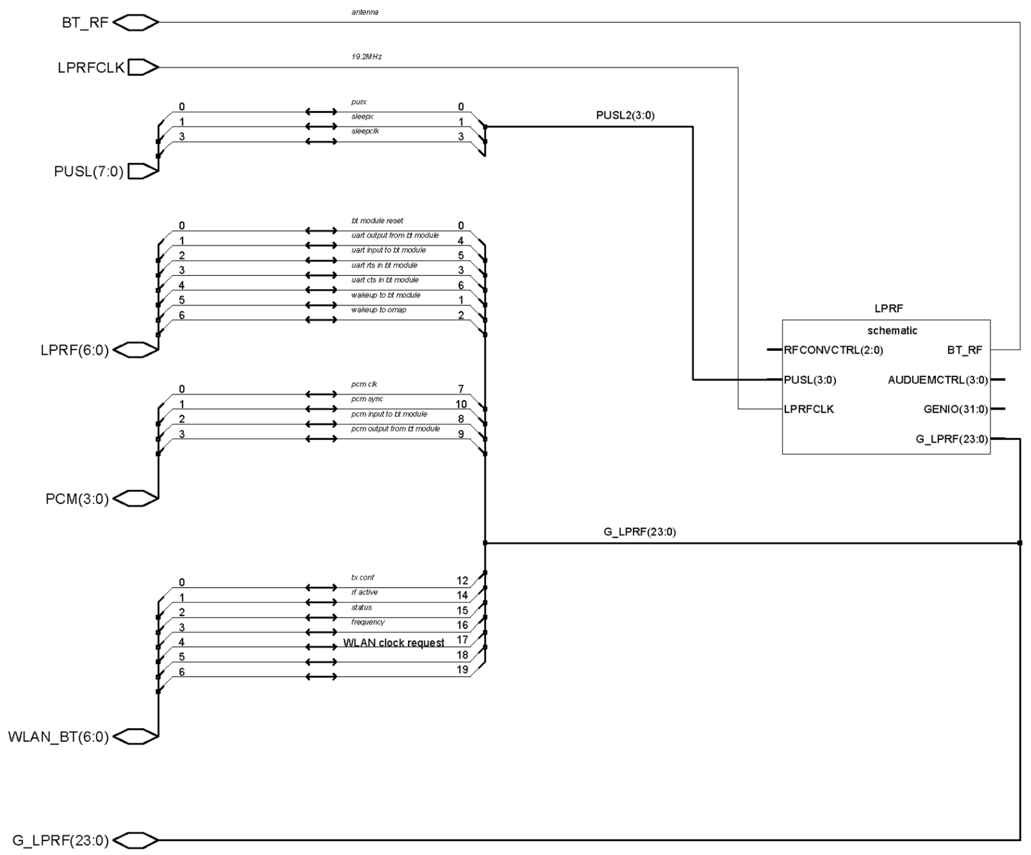

MMC(15:0)
0 J5208
10 J5206
1 J5200
6 J5201
2 J5209
7 J5202
3 J5210
15 J5205
4 J5204
5 J5211
8 J5203
CLK
CLK_FB
CMD
CMD_DIR
DATA0
DATA_DIR0
DATA1
DATA_DIR1
DATA2
DATA3
LS_ENABLE
VBAT
C5204
2u2
GND
N5200
EMIF06-SD02F3
Clk.h
Clk.f
CMD.h
CMD-dir
Dat0.h
Dat0-dir
Dat1.h
Dat123-dir
Dat2.h
Dat3.h
Enable
VBat
GND
GND
CLK-B
CMD-B
Dat0-B
Dat1-B
Dat2-B
Dat3-B
CD
WP
VCCB
VCCA
4340380
VIO
V_SD
C5201
100n
C5203
100n
C5202
2u2
R5206
100k
GND
CLK
CMD
DATA0
DATA1
DATA2
DATA3
SIM(6:0)
0
2
1
X2420
V_SD
DAT2
CLK
CMD
VDD
CD/DAT3
DAT0
DAT1
CARD PRESENCE
CARD INSERTION/REMOVAL PREWARNING
VSIM
SIMCLK
SIMRST
SIMDATA
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
VSIM1
5469493
GND
0
1
2
3
4
5
6
7
11
9
C5205
1n0
C5206
1n0
GND

UI

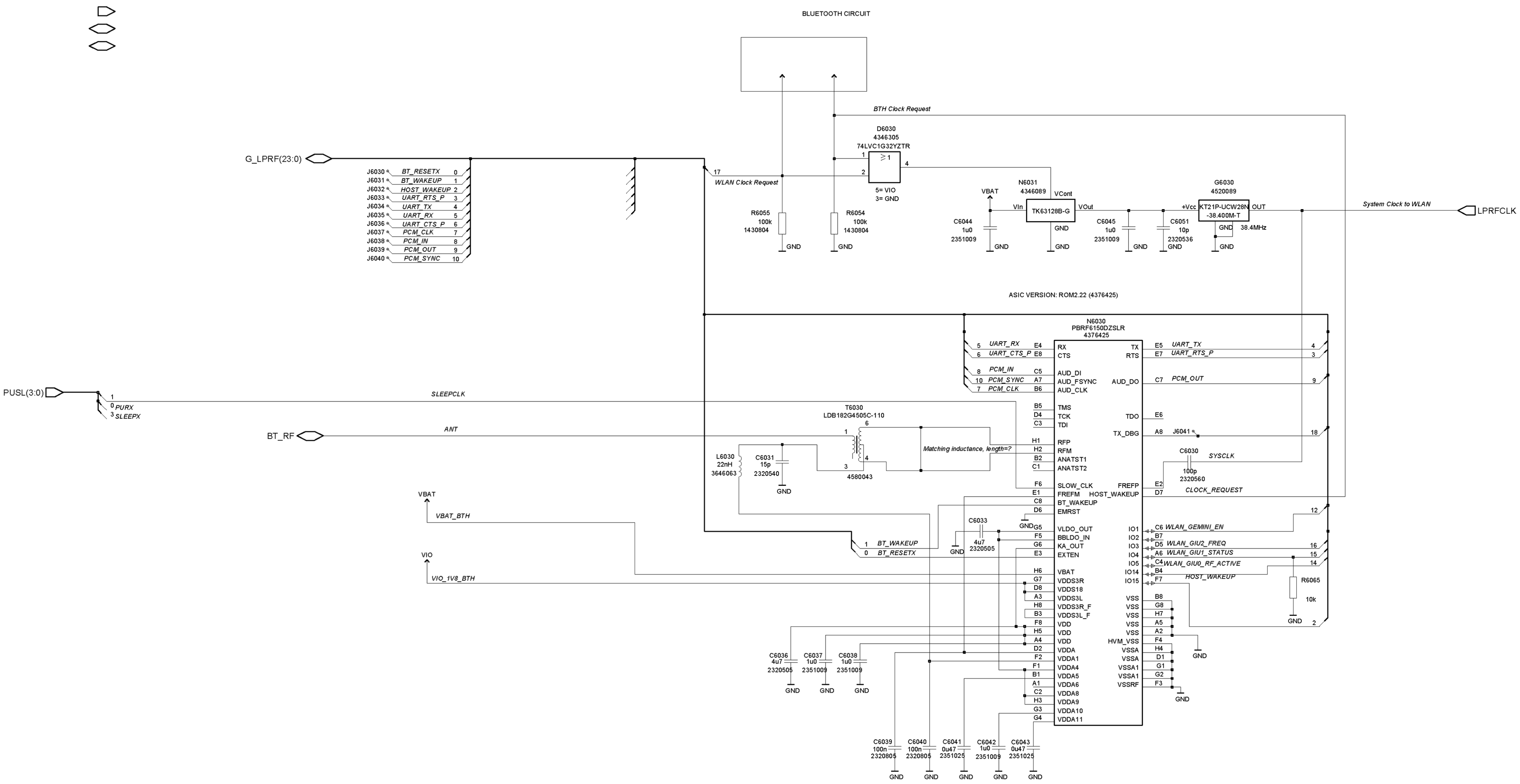

MESSI_VIDEO_APE(25:0)
EL driver
VAUX
VBAT
N4400
PEMD9
4210571
R4402
27k
N4401
1DDD381AA-C33
E
V+
GND
VOUT
4346395
L4400
600R/100MHz
R4413
0R
X4402
X4403
R4400
220k
C4401
100n
R4406
0R
not_assembled
C4413
1n
not_assembled
GND
D4400
74AUC1G08YZTR
&
5=VIO
3=GND
BETTY_CTRL_CMT(4:0)
To N2300 GENIOUT1
VIO
C4402
100n
Z4401
EMIF10-LCD02F3
4129289
Z4400
EMIF10-LCD02F3
4129289
Z4402
EMIF10-LCD02F3
Output1
Input1
kbc_5
kbc_4
D7
D5
D3
D1
D/CX
RDX
WRX
D0
D2
D4
D6
CSX
RESX
TE
UI flex connector
X4400
5469785
S60 KEY VLED-
S60 KEY VLED+
Kbc 4
Kbc 3
Kbc 2
VAUX
L4402
600R/100MHz
VLED2-
VLED1+
VDD 2.78V
ALS VDD
WING_ALS_VDD
ALS SIGNAL OUT
EARP
EARN
POWER KEY
Kbr 0
Kbr 1
Kbr 2
Kbc 0
Kbc 1
VDDI 1.8V
L4401
600R/100MHz
C4403
27p
C4411
27p
C4400
27p
To N2300 sheet
SETCURR1
From N2300 sheet
VLEDOUT1
V4400
PEMD9
PACKAGE
PEMT1
L4403
600R/100MHz
C4414
27p
not_assembled
BETTY_CTRL_CMT(4:0)
2SC5658QRS
V4406
R4405
470R
S60 keypad lighting switch
SLOWAD(6:0)
Light sensor
C4410
27p
PWRONX
POWER KEY
R4410
4k7
C4409
27p
FLEX_AUDIO(3:0)
EARP
EARN
VIO
R4401
100k
N4402
SH248CSP
VDD
Output
GND
R4404
100R
C4404
2u2
C4405
1n0
2320744
SLIDE POSITION DETECTION
IR(7:0)
N4403
TFBS5700-TR3
IREDA
TXD
RXD
SD
VCC
R4403
4R7
VBAT
C4406
4u7
RTS3/SD_MODE
INFRARED MODULE
C4408
100n
C4407
27p
KEYB(19:0)
kbr_0
kbr_1
kbr_2
kbr_3
kbr_4
kbr_5
kbc_0
kbc_1
kbc_2
kbc_3
kbc_4
kbc_5
C4415
4n7
C4416
4n7
C4417
4n7
not_assembled
SIDE_KEYS(3:0)
ALS supply voltage switch
N4404
TS5A6542YZTR
NC
NO
COM
IN
VIO
5= VAUX
2,8= GND
T9 keyboard connector
X4401
5469573
kbr 3
kbr 4
kbr 5
kbc 0
kbc 1
kbc 2
kbc 3
C4412
4n7
not_assembled

COMPANY CONFIDENTIAL

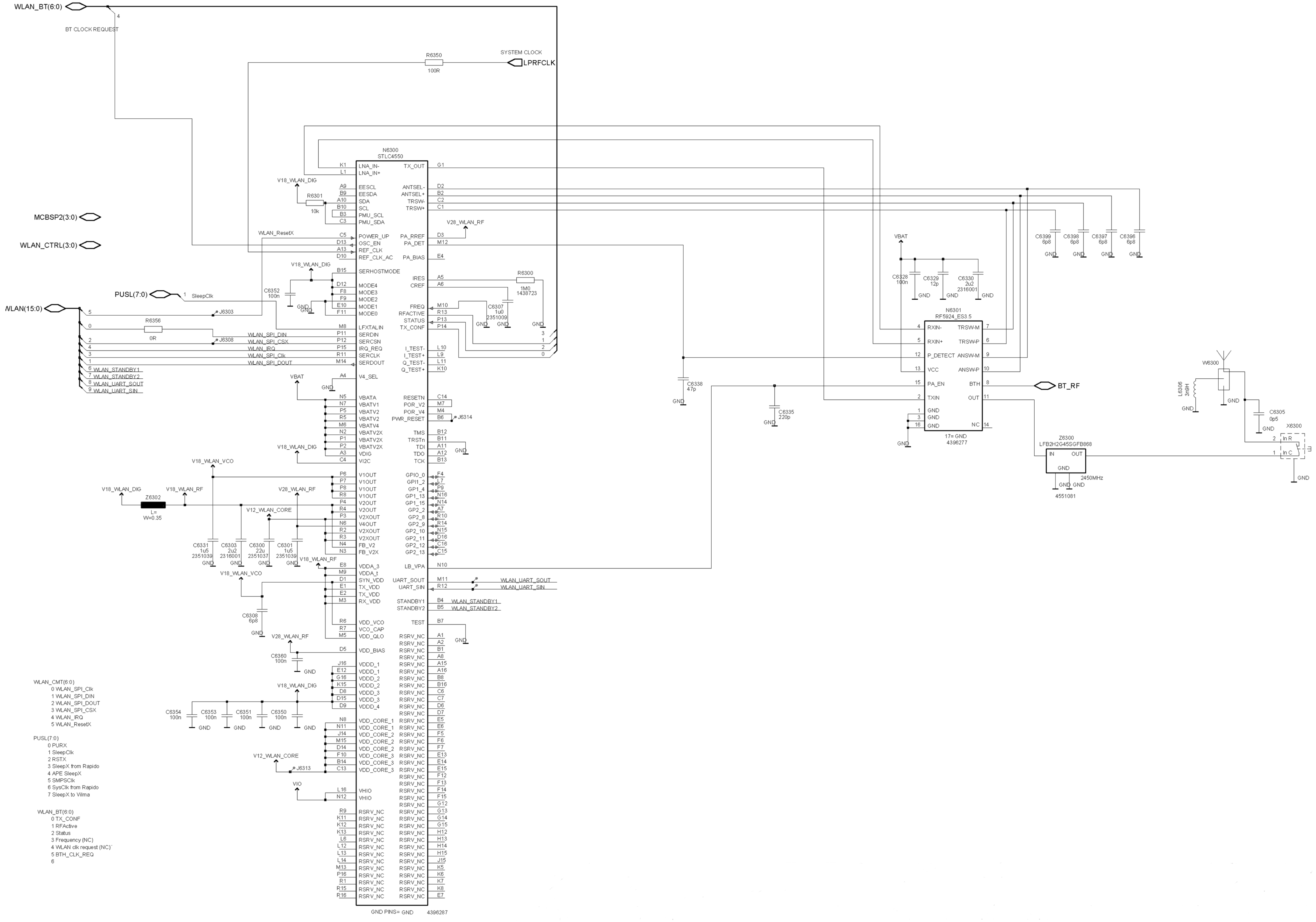
BT interface


BT_RF
antenna
LPRFCLK
19.2MHz
PUSL(7:0)
purx
sleepx
sleepclk
PUSL2(3:0)
bt module reset
uart output from bt module
uart input to bt module
uart rts in bt module
uart cts in bt module
wakeup to bt module
wakeup to omap
LPRF(6:0)
pcm clk
pcm sync
pcm input to bt module
pcm output from bt module
PCM(3:0)
LPRF
schematic
RFCONVCTRL(2:0)
PUSL(3:0)
LPRFCLK
BT_RF
AUDUEMCTRL(3:0)
GENIO(31:0)
G_LPRF(23:0)
G_LPRF(23:0)
tx conf
rf active
status
frequency
WLAN clock request
WLAN_BT(6:0)
G_LPRF(23:0)

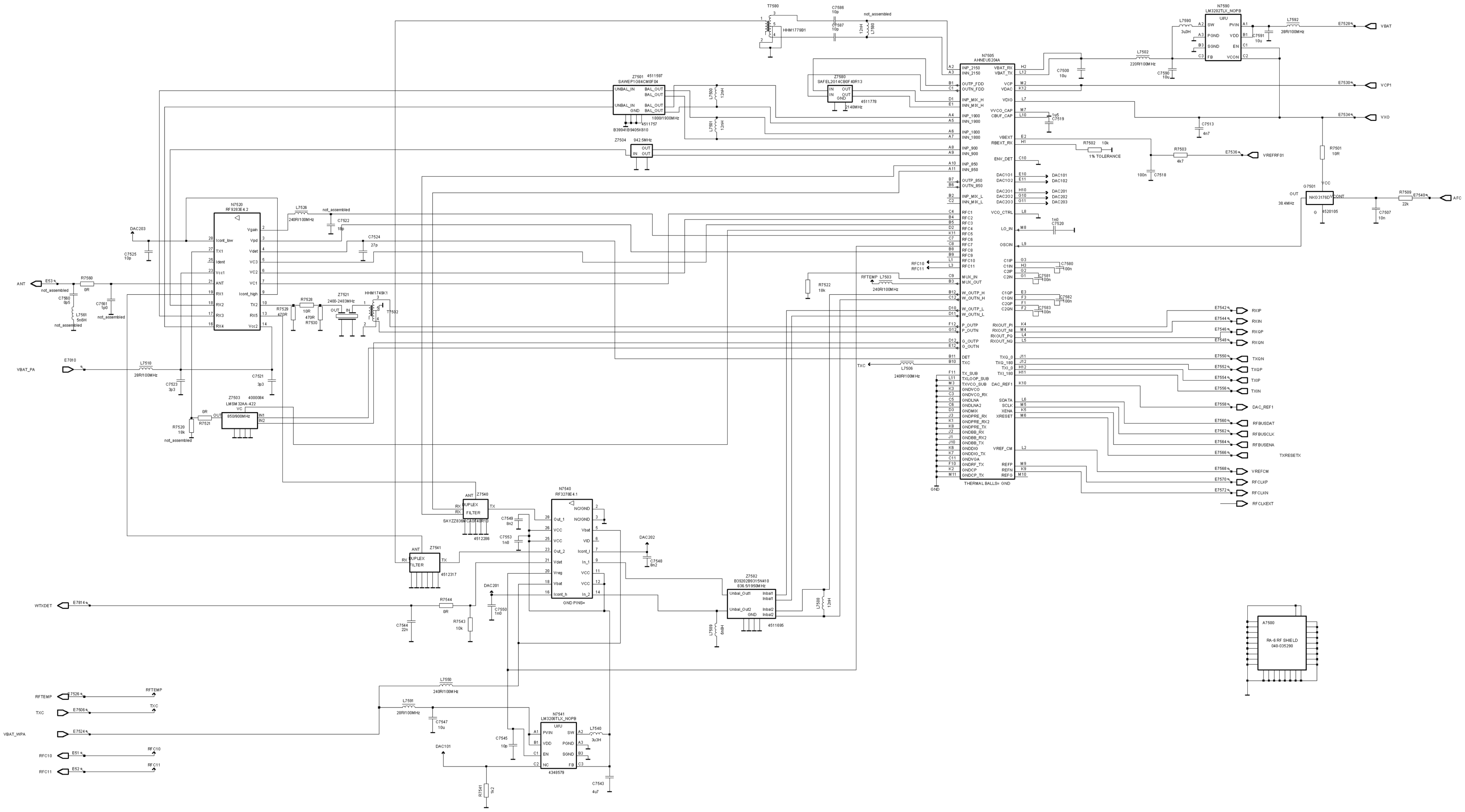
BTHcost


BLUETOOTH CIRCUIT
BTH Clock Request
D6030
4346305
74LVC1G32YZTR
5= VIO
3= GND
WLAN Clock Request
G_LPRF(23:0)
J6030 BT_RESETX 0
J6031 BT_WAKEUP 1
J6032 HOST_WAKEUP 2
J6033 UART_RTS_P 3
J6034 UART_TX 4
J6035 UART_RX 5
J6036 UART_CTS_P 6
J6037 PCM_CLK 7
J6038 PCM_IN 8
J6039 PCM_OUT 9
J6040 PCM_SYNC 10
R6055 100k 1430804
R6054 100k 1430804
VBAT
N6031 4346089
TK63128B-G
VIn
VOut
VCont
C6044 1u0 2351009
C6045 1u0 2351009
C6051 10p 2320536
G6030 4520089
KT21P-UCW28N -38.400M-T
+Vcc
OUT
38.4MHz
System Clock to WLAN
LPRFCLK
GND
ASIC VERSION: ROM2.22 (4376425)
N6030
PBRF6150DZSLR
4376425
PUSL(3:0)
PURX
SLEEPX
SLEEPCLK
BT_RF
ANT
T6030
LDB182G4505C-110
4580043
Matching inductance, length=?
L6030 22nH 3646063
C6031 15p 2320540
VBAT_BTH
VIO
VIO_1V8_BTH
BT_WAKEUP
BT_RESETX
C6033 4u7 2320505
RX
CTS
AUD_DI
AUD_FSYNC
AUD_CLK
TMS
TCK
TDI
RFP
RFM
ANATST1
ANATST2
SLOW_CLK
FREFM
BT_WAKEUP
EMRST
VLDO_OUT
BBLDO_IN
KA_OUT
EXTEN
VBAT
VDDS3R
VDDS18
VDDS3L
VDDS3R_F
VDDS3L_F
VDD
VDDA
VDDA1
VDDA4
VDDA5
VDDA6
VDDA8
VDDA9
VDDA10
VDDA11
TX
RTS
AUD_DO
TDO
TX_DBG
FREFP
HOST_WAKEUP
IO1
IO2
IO3
IO4
IO5
IO14
IO15
VSS
HVM_VSS
VSSA
VSSA1
VSSRF
UART_TX
UART_RTS_P
PCM_OUT
J6041
C6030 100p 2320560
SYSCLK
CLOCK_REQUEST
WLAN_GEMINI_EN
WLAN_GIU2_FREQ
WLAN_GIU1_STATUS
WLAN_GIU0_RF_ACTIVE
HOST_WAKEUP
R6065 10k
C6036 4u7 2320505
C6037 1u0 2351009
C6038 1u0 2351009
C6039 100n 2320805
C6040 100n 2320805
C6041 0u47 2351025
C6042 1u0 2351009
C6043 0u47 2351025

WLAN


WLAN_BT(6:0)
BT CLOCK REQUEST
R6350
100R
SYSTEM CLOCK
LPRFCLK
N6300
STLC4550
LNA_IN-
LNA_IN+
TX_OUT
EESCL
EESDA
SDA
SCL
PMU_SCL
PMU_SDA
ANTSEL-
ANTSEL+
TRSW-
TRSW+
V28_WLAN_RF
V18_WLAN_DIG
R6301
10k
MCBSP2(3:0)
WLAN_CTRL(3:0)
WLAN_ResetX
POWER_UP
OSC_EN
REF_CLK
REF_CLK_AC
PA_RREF
PA_DET
PA_BIAS
SERHOSTMODE
MODE4
MODE3
MODE2
MODE1
MODE0
IRES
CREF
R6300
1M0
1438723
PUSL(7:0)
SleepClk
C6352
100n
WLAN(15:0)
J6303
R6356
0R
J6308
FREQ
RFACTIVE
STATUS
TX_CONF
C6307
1u0
2351009
LFXTAL IN
SERDIN
SERCSN
IRQ_REQ
SERCLK
SERDOUT
WLAN_SPI_DIN
WLAN_SPI_CSX
WLAN_IRQ
WLAN_SPI_Clk
WLAN_SPI_DOUT
WLAN_STANDBY1
WLAN_STANDBY2
WLAN_UART_SOUT
WLAN_UART_SIN
I_TEST-
I_TEST+
Q_TEST-
Q_TEST+
VBAT
V4_SEL
VBATA
VBATV1
VBATV2
VBATV4
VBATV2X
VDIG
VI2C
RESETN
POR_V2
POR_V4
PWR_RESET
J6314
TMS
TRSTn
TDI
TDO
TCK
V18_WLAN_VCO
V1OUT
V2OUT
V2XOUT
V4OUT
FB_V2
FB_V2X
GPIO_0
GPI1_2
GP1_4
GP1_13
GP1_15
GP2_2
GP2_8
GP2_9
GP2_10
GP2_11
GP2_12
GP2_13
Z6302
L=
W=0.35
V18_WLAN_RF
V28_WLAN_RF
V12_WLAN_CORE
C6331
1u5
2351039
C6303
2u2
2316001
C6300
22u
2351037
C6301
1u5
2351039
VDDA_3
VDDA_I
SYN_VDD
TX_VDD
RX_VDD
LB_VPA
UART_SOUT
UART_SIN
STANDBY1
STANDBY2
C6308
6p8
VDD_VCO
VCO_CAP
VDD_QLO
TEST
VDD_BIAS
C6360
100n
VDDD_1
VDDD_2
VDDD_3
VDDD_4
RSRV_NC
C6354
100n
C6353
100n
C6351
100n
C6350
100n
VDD_CORE_1
VDD_CORE_2
VDD_CORE_3
J6313
VIO
VHIO
GND PINS= GND
4396287
C6338
47p
C6335
220p
VBAT
C6328
100n
C6329
12p
C6330
2u2
2316001
N6301
RF5924_ES3.5
RXIN-
RXIN+
P_DETECT
VCC
PA_EN
TXIN
GND
TRSW-M
TRSW-P
ANSW-M
ANSW-P
BTH
OUT
NC
17= GND
4396277
C6399
6p8
C6398
6p8
C6397
6p8
C6396
6p8
BT_RF
Z6300
LFB2H2G45SGFB868
IN
OUT
2450MHz
4551081
W6300
L6306
3n9H
C6305
0p5
X6300
In R
In C
GND
WLAN_CMT(6:0)
0 WLAN_SPI_Clk
1 WLAN_SPI_DIN
2 WLAN_SPI_DOUT
3 WLAN_SPI_CSX
4 WLAN_IRQ
5 WLAN_ResetX
PUSL(7:0)
0 PURX
1 SleepClk
2 RSTX
3 SleepX from Rapido
4 APE SleepX
5 SMPSClk
6 SysClk from Rapido
7 SleepX to Vilma
WLAN_BT(6:0)
0 TX_CONF
1 RFActive
2 Status
3 Frequency (NC)
4 WLAN clk request (NC)
5 BTH_CLK_REQ
6

RF engine


T7580
HHM1779B1
C7586
10p
C7587
10p
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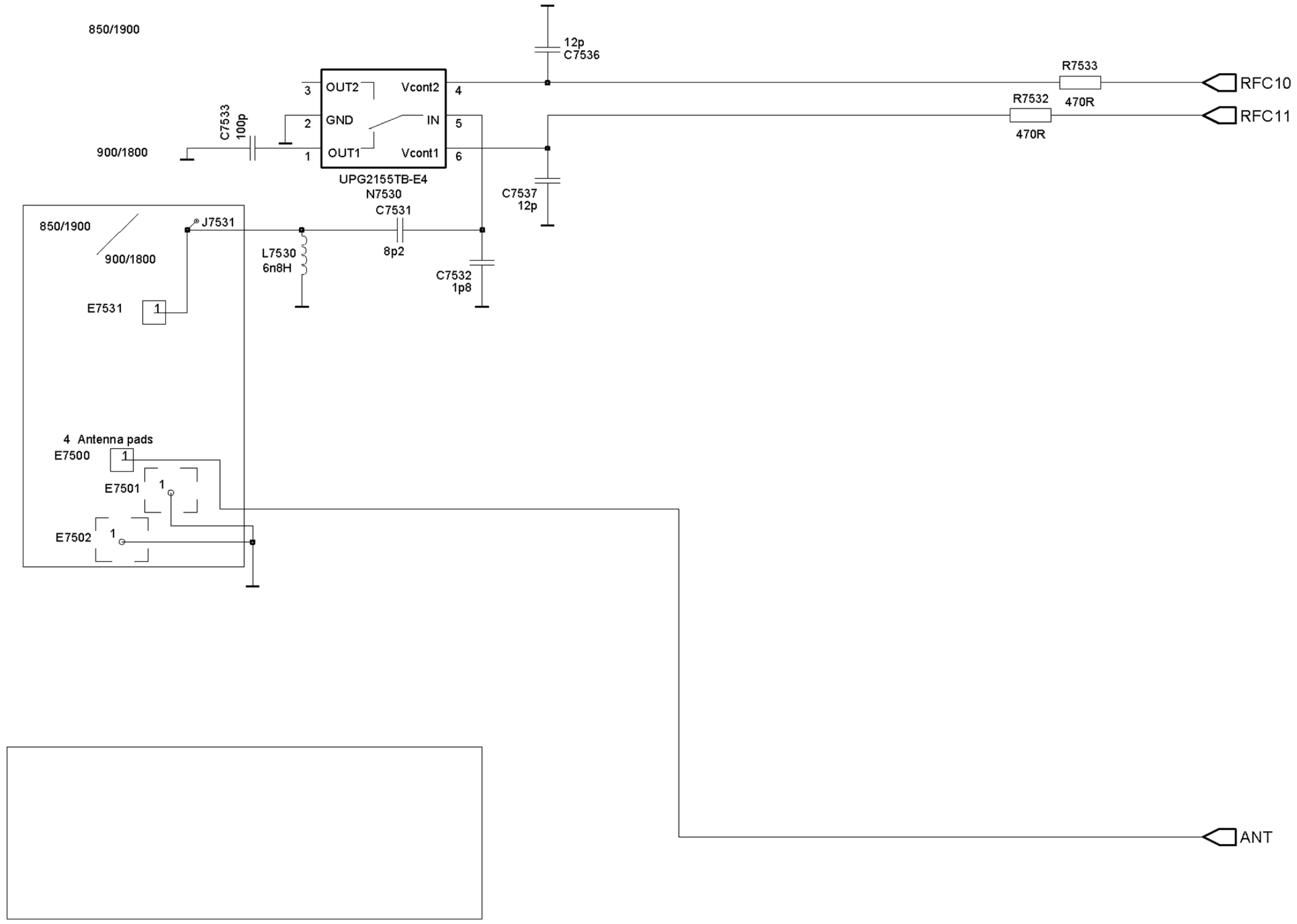
N7505
AHNEUS204A
Z7501
SAWEP1G84CM0F0A
B39941B9405K610
4511757
1800/1900MHz
Z7580
SAFEL2G14CB0F40R13
4511779
2140MHz
Z7504
942.5MHz
N7520
RF9283E4.2
L7526
240R/100MHz
C7522
C7524
27p
DAC203
C7525
10p
ANT
E53
R7560
0R
not_assembled
C7560
0p5
L7561
5n6H
C7561
1p0
Z7521
2400-2483MHz
HHM1749K1
T7502
R7528
10R
R7529
470R
R7530
470R
VBAT_PA
E7010
L7510
28R/100MHz
C7521
3p3
C7523
3p3
Z7503
4000084
LMSM32AA-422
R7529
18k
R752I
not_assembled
ANT
Z7540
DUPLEX FILTER
SAYZZ836M-CA0F4R10
4512286
N7540
RF3278E4.1
C7549
8n2
C7553
1n0
DAC202
C7548
8n2
Z7541
DUPLEX FILTER
4512317
DAC201
C7550
1n0
R7544
0R
C7544
22n
R7543
10k
GND PINS=
Z7582
B3920B9315N410
836.5/1950MHz
4511695
L7589
6n8H
L7588
12nH
WTXDET
E7814
RFTEMP
E7526
TXC
E7506
VBAT_WPA
E7524
RFC10
E51
RFC11
E52
L7550
240R/100MHz
L7591
28R/100MHz
C7547
10u
N7541
LM3208TLX_NOPB
C7545
10p
DAC101
L7540
3u3H
C7543
4u7
R7541
1k2
4348579
N7590
LM3202TLX_NOPB
L7590
3u3H
L7592
28R/100MHz
E7528
VBAT
C7591
10u
L7502
220R/100MHz
C7590
10u
C7500
10u
E7530
VCP1
E7534
VXO
C7513
4n7
C7519
1u5
R7502
10k
1% TOLERANCE
R7503
4k7
E7536
VREFRF01
R7501
10R
C7518
100n
G7501
NKG3176D
4520105
38.4MHz
R7509
22k
E7540
AFC
C7507
10n
RFTEMP
L7503
240R/100MHz
R7522
18k
TXC
L7506
240R/100MHz
C7520
1n0
C7580
100n
C7581
100n
C7582
100n
C7583
100n
RXIP
RXIN
RXQP
RXQN
TXQN
TXQP
TXIP
TXIN
DAC_REF1
RFBUSDAT
RFBUSCLK
RFBUSENA
TXRESETX
VREFCM
RFCLKP
RFCLKN
RFCLKEXT
THERMAL BALLS= GND
GND
A7500
RA-6 RF SHIELD
640-035290

Antenna interface


850/1900
12p
C7536
R7533
470R
RFC10
R7532
470R
RFC11
3
OUT2
Vcont2
4
2
GND
IN
5
1
OUT1
Vcont1
6
C7533
100p
900/1800
UPG2155TB-E4
N7530
C7531
8p2
C7537
12p
850/1900
J7531
900/1800
L7530
6n8H
C7532
1p8
E7531
1
4 Antenna pads
E7500
1
E7501
1
E7502
1
ANT

Glossary

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A/D-converter	Analog-to-digital converter
ACI	Accessory Control Interface
ADC	Analog-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic ,type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2,UEME and Zocus
CCP	Compact Camera Port
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSR	cambridge silicon radio
CSTN	Color Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analouge converter
DAC	Digital-to-analouge converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo
DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package

DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evaluation
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compability
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared
IrDA	Infrared Data Associasion
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode

LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architechture
OMAP	Operations, maintenance, and administartion part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency
RF PopPort TM	Reduced function PopPortTM interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multi Media Card
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver

SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noice ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP, Official Tiku3G
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator
VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WD	Watchdog
XHTML	Extensible hypertext markup language
Zocus	Current sensor, (used to monitor the current flow to and from the battery)